

FLIGHT

6^D

The
AIRCRAFT ENGINEER
AND AIRSHIPS

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

p. 1378
ol. XXVII

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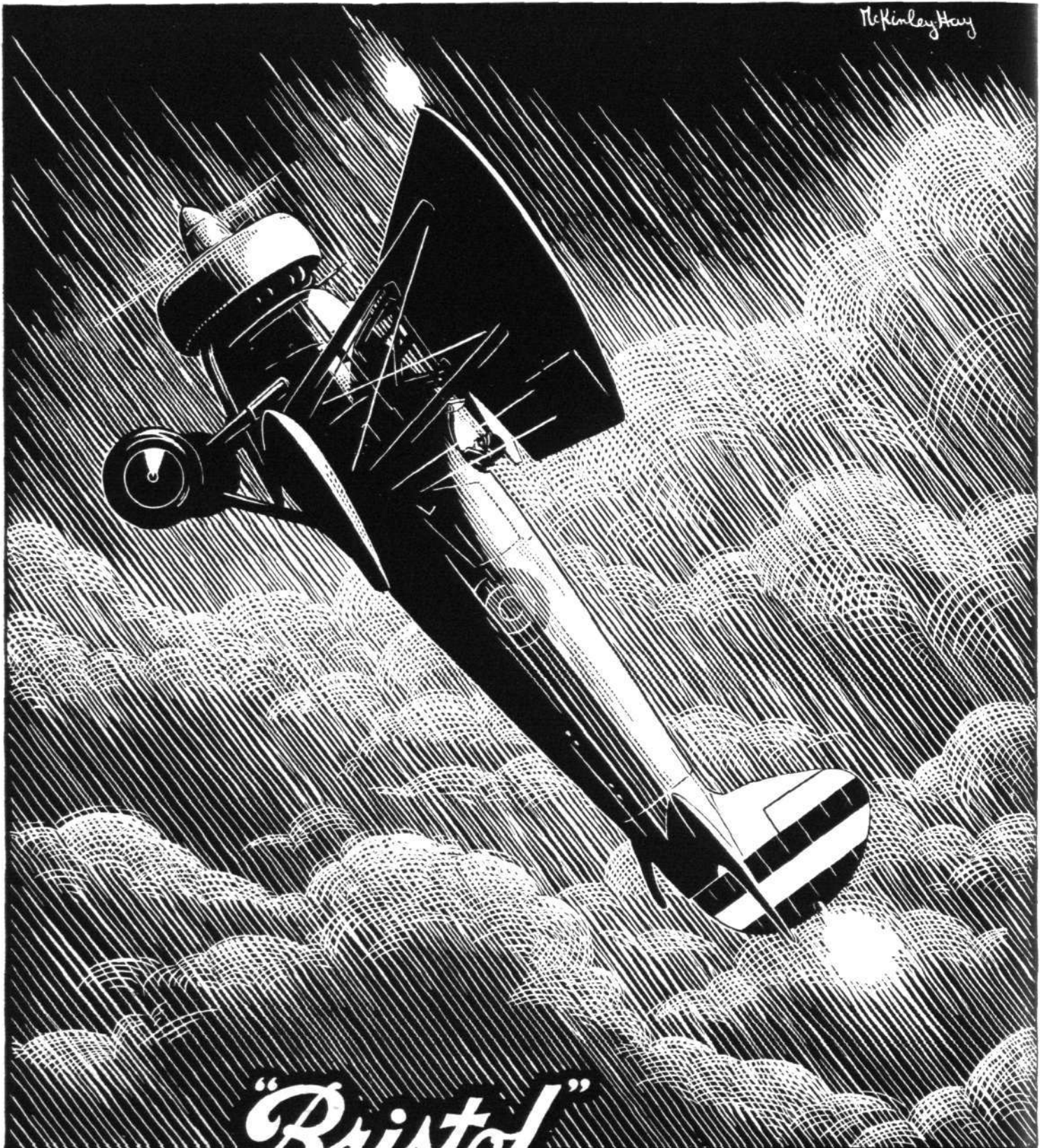
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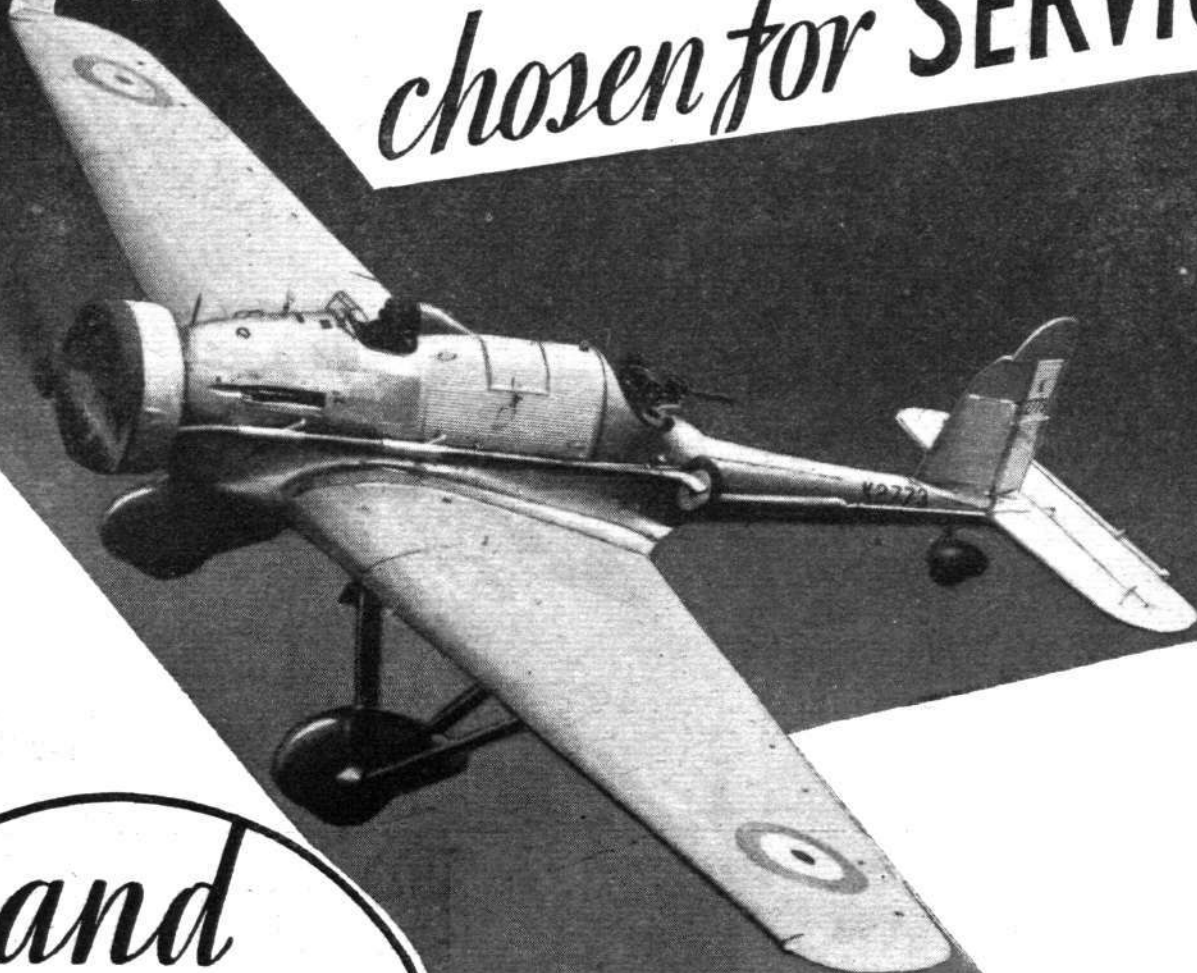
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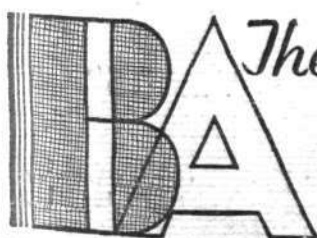
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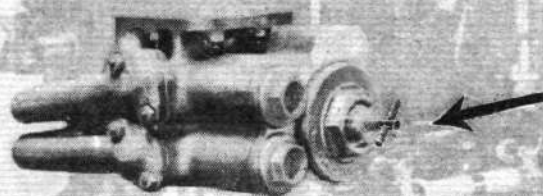
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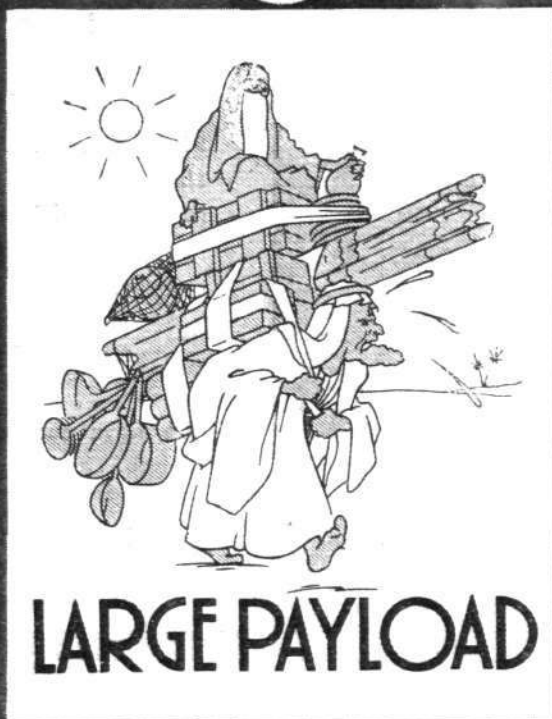
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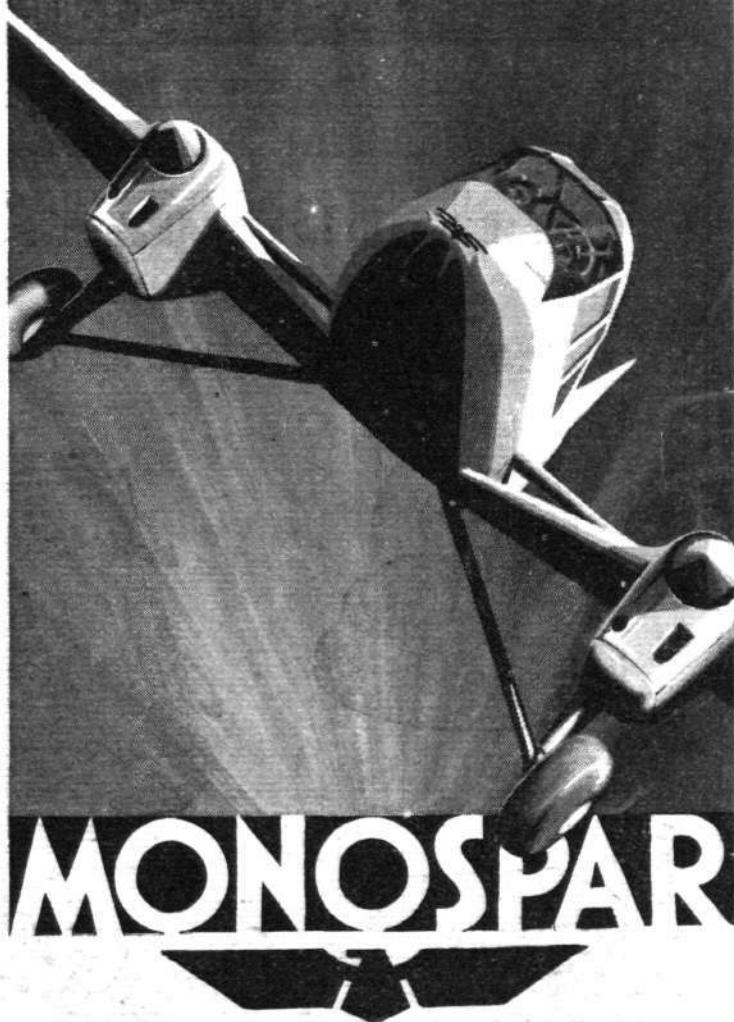
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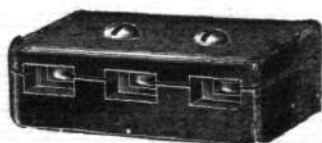
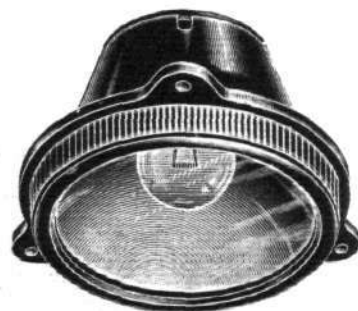
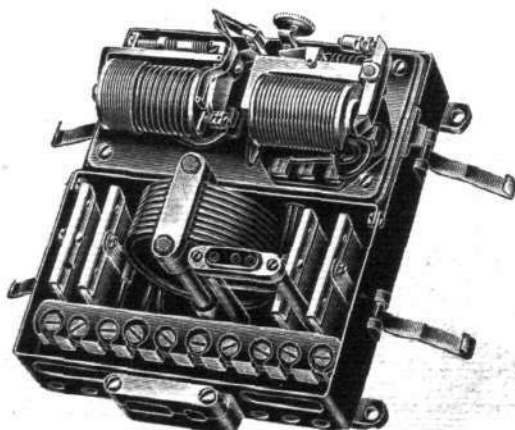
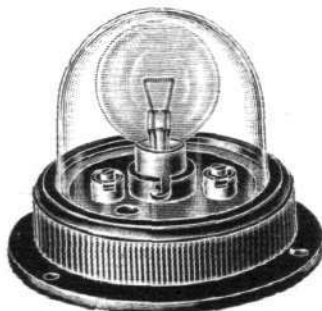
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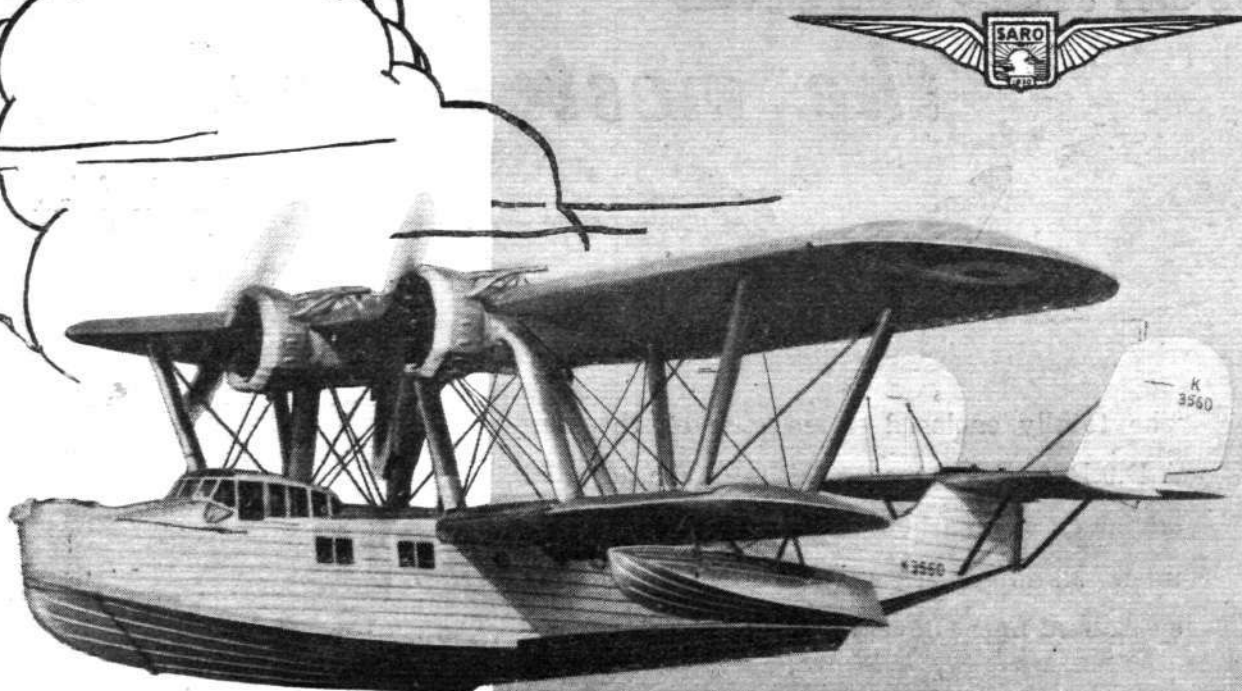
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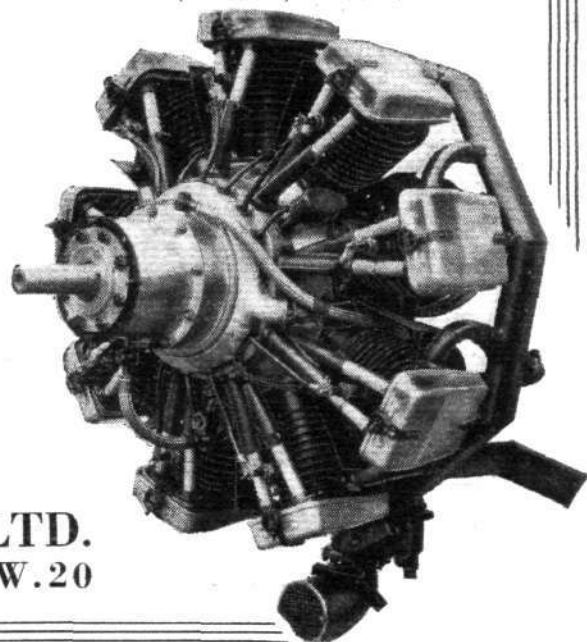
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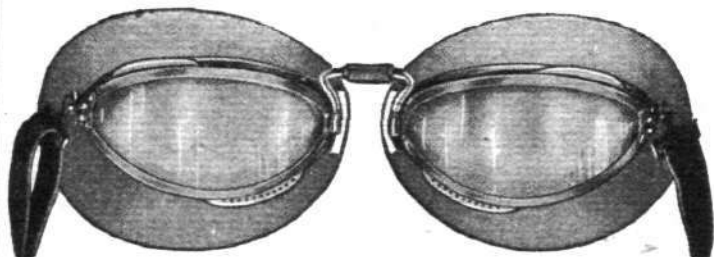
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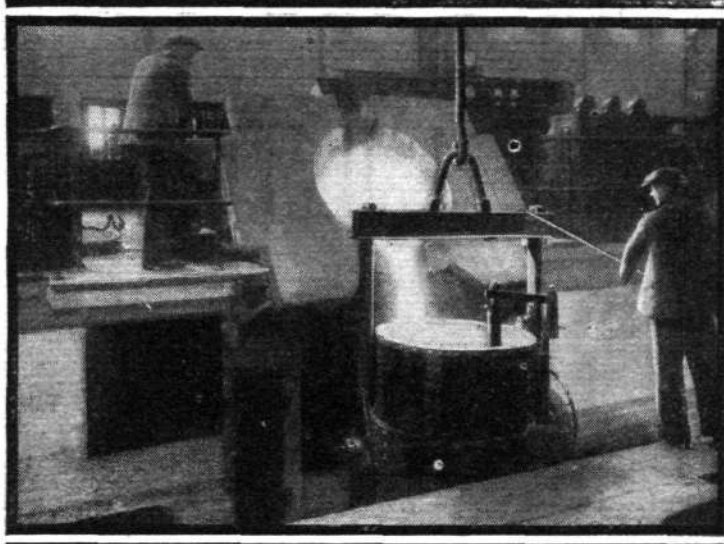
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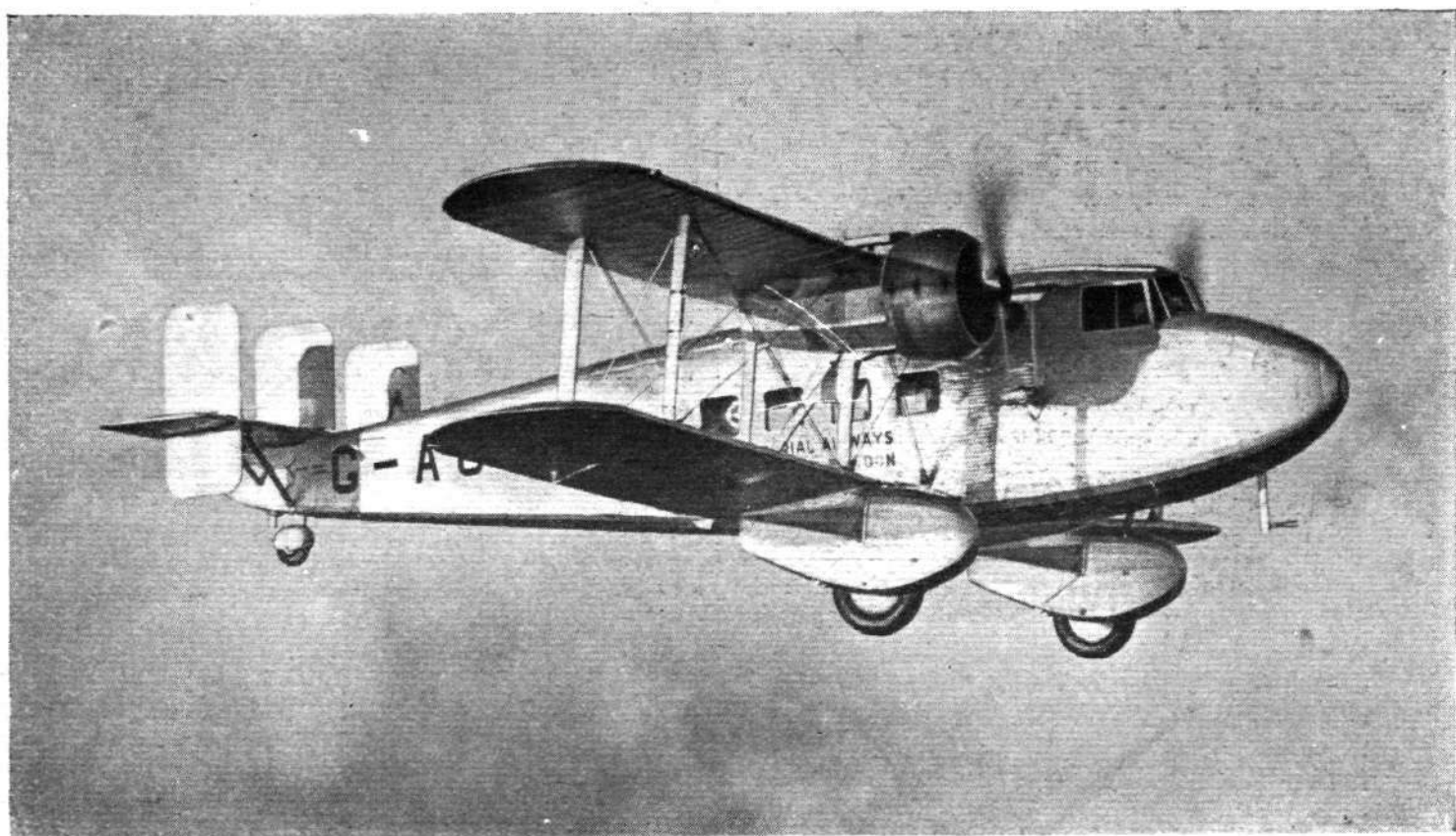
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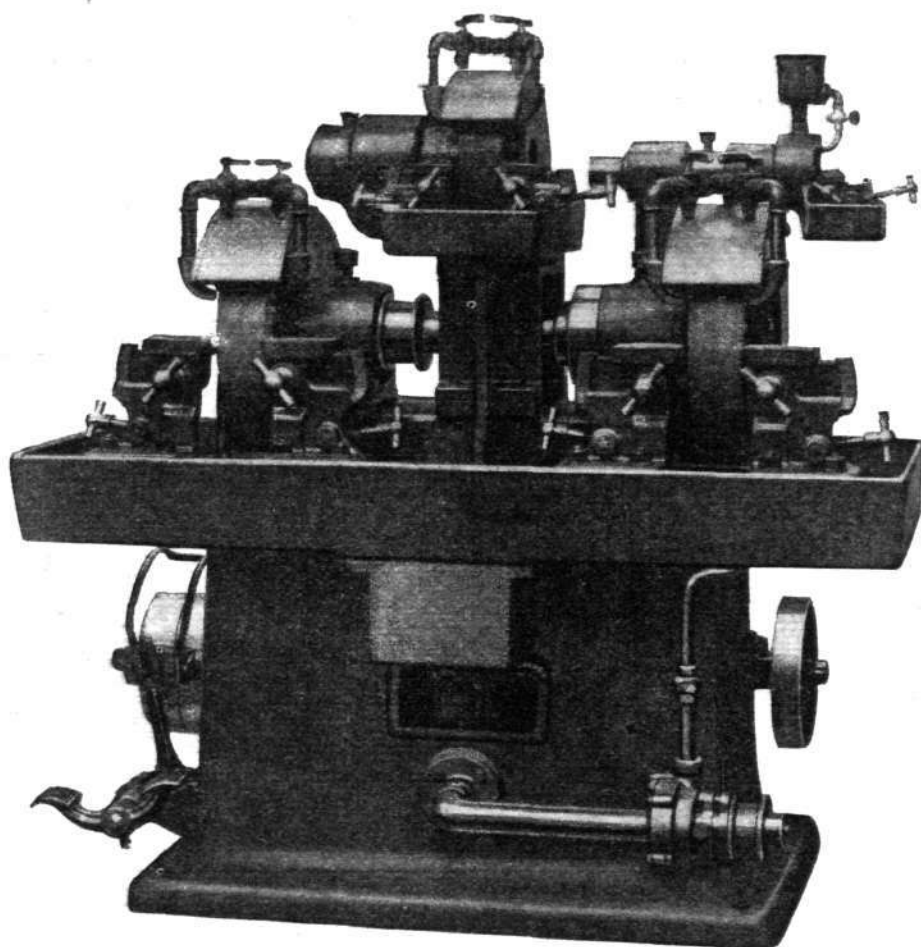
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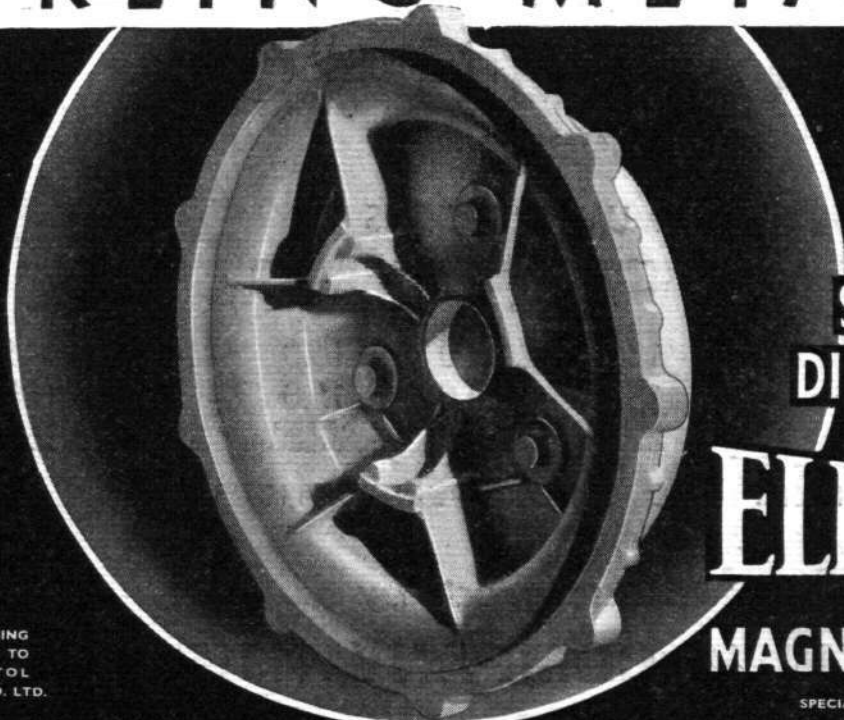
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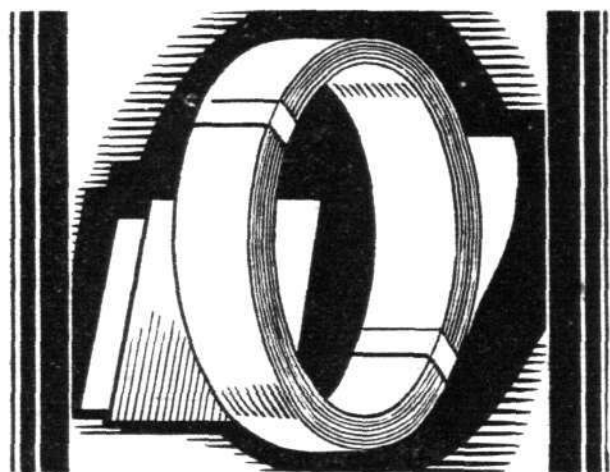
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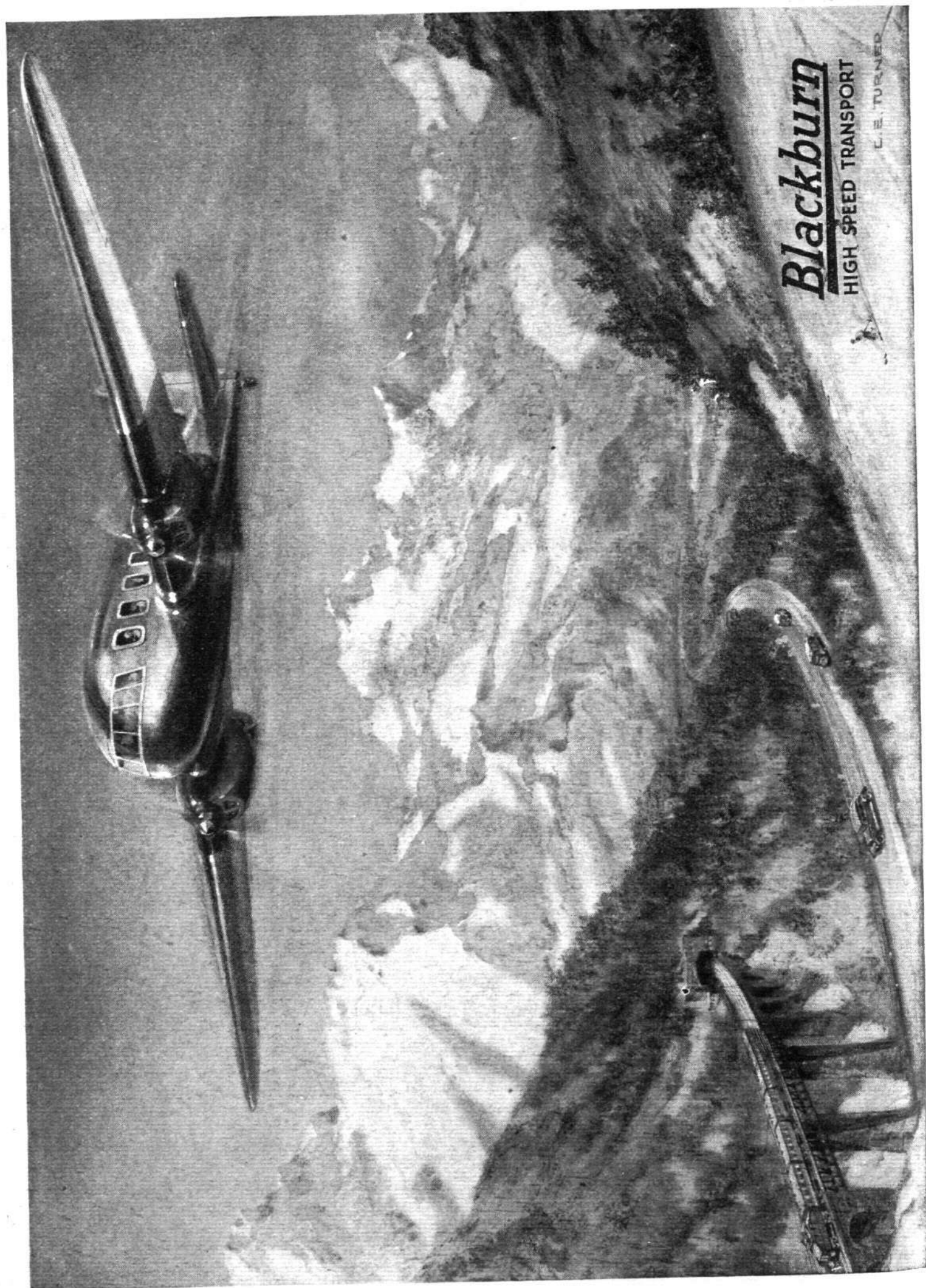
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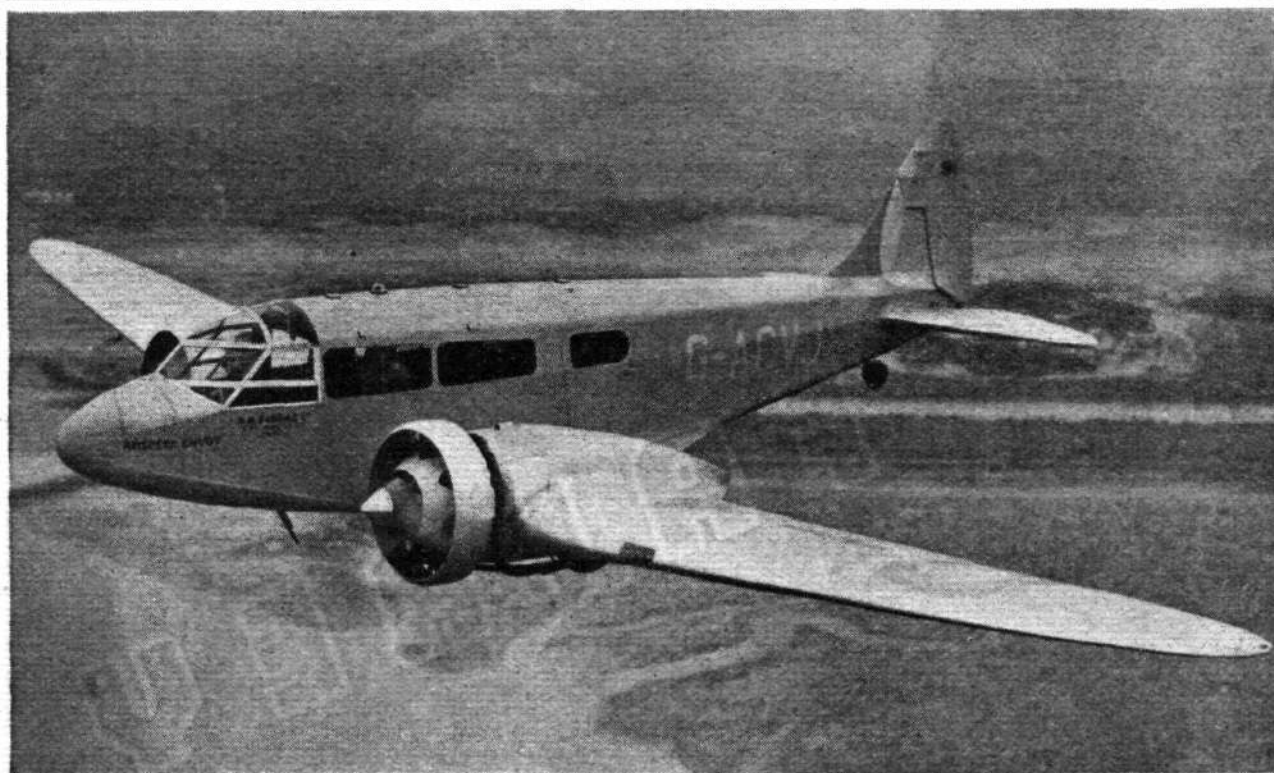
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Founded in 1909

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No. 1378. Vol. XXVII.

MAY 23, 1935

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Progress

ISSUED with *Flight* this week is a pictorial supplement which illustrates a wide variety of types of modern British aircraft, civil and military. Many of these types, incidentally, will be seen at aerodromes next Saturday, Empire Air Day, at the R.A.F. and S.B.A.C. Displays at Hendon in June, and at the Royal Jubilee Fly-past at Duxford in July.

In order to give newer readers a glimpse of the earliest British aeroplanes, and to refresh the memory of those who do recall the early flying days, we also publish this week special illustrated articles dealing with some of the early aeroplanes and engines which "made history," and from which the wonderful modern British types may be said to have developed. In this way readers will be the better able to form their own opinions of the progress since a Wright biplane made the first flight in 1903. They will, we think, be filled with admiration for the courage of the pioneers who first ventured into the air on their crude contraptions, the behaviour of which could not be foreseen and the strength of which was problematic. (Cynics may take the view that it was a case of ignorance being bliss!)

To attempt to evaluate the progress which has been made from, let us say, 1908-09—when real flying began—to the present time would be outside the scope of the brief surveys we are able to publish this week. The increase of speed from about 40 m.p.h. to more than 440 m.p.h. looks, superficially, like tremendous progress. On the other hand, there are, we know, those who are prepared to argue that no real aerodynamic progress has been made. They say that if one were to take, for example, a modern military biplane, retain its external form but reduce its weight to approximately that of the early machines, and put in an engine of 40-50 h.p., the

speed would not be very greatly superior to that attained by the old aeroplanes.

While this argument is not altogether sound, it contains a modicum of truth. Of some of the old aeroplanes, whose designers were necessarily a little hazy on stress calculations, it used to be jokingly said that if they saw a space anywhere large enough for a bird to fly through, they would add another bracing wire. This was referred to as "passing the thrust test." Redundant bracing was certainly to be seen side by side with imperfect bracing in the same machine, but of structural breakages there were, on the whole, very few. The materials we use nowadays are a great deal more "refined," and we have learned a little more about the stresses likely to be set up in structural members. On the other hand, considerations of usefulness demand that we throw away as little weight as possible, and so we are probably working the better materials closer to their limits than did the pioneers their "stick-and-string" constructions.

Controllability

On the aerodynamic side it is probably true to say that the greatest advance has been made in the direction of controllability. An enormous amount of research work has been directed towards this particular subject, and the controls of the modern aeroplane are vastly more effective. Yet they are fundamentally the same, if one excepts the substitution of ailerons for wing-warping. Aeroplanes still stall; some of them spin. "Loss of flying speed" was the expression used in the old days, but the result was the same. "Getting into a spiral nose dive" was how we used to describe the evolution now called a spin, but that did not make it any more nor any less dangerous. What can be claimed is that the speed range of the modern aeroplane is much greater than was that of the earliest machines. With their low-

power engines the old aeroplanes were perilously close to being what the French used to call *tangent*—i.e., the "power available" curve was very nearly a tangent to the "power required" curve, a condition corresponding to flying with little or no speed range.

Where very real progress *can* justifiably be claimed is in the development of the aircraft power plant. From engines developing a sometimes doubtful 30 h.p. and weighing from 4 to 7 pounds per horse-power, with reliability a doubtful quantity, we have reached 1,000 h.p. or more, with weights as low as just over one pound per horse-power, and reliability to be marvelled at. Truly, the aircraft designer has, as Major Bulman said at the Martlesham dinner last year, been very well served by the engine people. It is high time that he really sat down and did a little hard thinking instead of stretching out his hand for the telephone to ask the engine designer for "a few more horses."

Unity of Command

PROBABLY everybody who has considered the matter is of the opinion that the ideal would be to have one head of all the three fighting Services, yet practically everybody who has gone into the details of the matter has come to the conclusion that for Britain that ideal is not practical politics. Lord Mottistone raised the question once more in the House of Lords the other day, but it is difficult to gather exactly what reform he wanted. It seemed to boil down to the appointment of a whole-time chairman of the Committee of Imperial Defence in place of the Prime

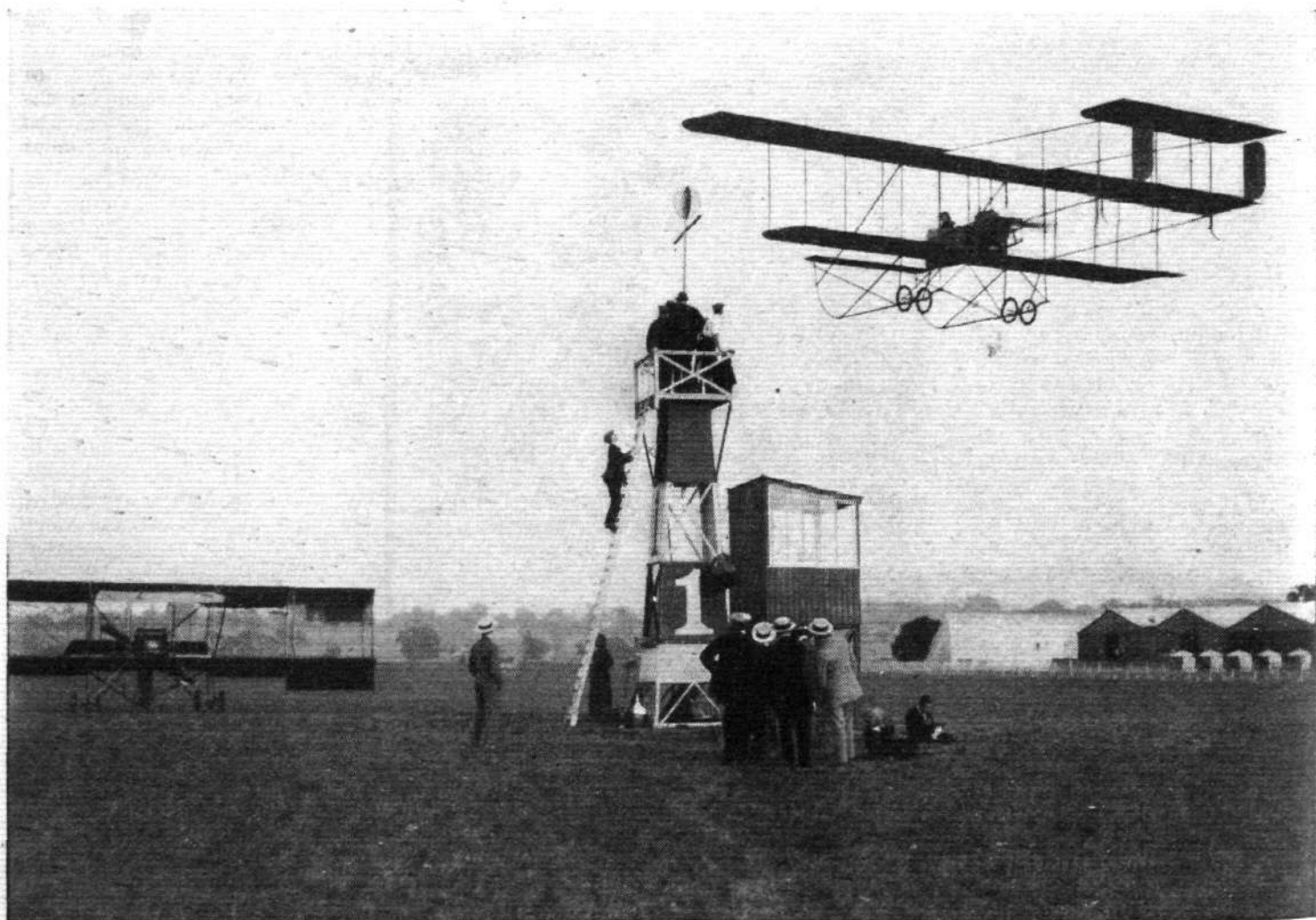
Minister, who is, it is generally admitted, overworked.

One of the good points on which Lord Mottistone touched was that of supply. It has seemed to many people that more might be done to unify and standardise certain lines of supply for the three Services. As regards personnel, it has been suggested that there should be one Medical Service for all three fighting Services, and likewise one Chaplains' Service, but it is by no means certain that such a reform would cause any material reduction in personnel or any saving of money.

Unity of Supply

In one very important respect unity of supply has been achieved. The Air Ministry is the source of supply of aircraft and accessories for all three Services, and this arrangement has worked admirably. At times it has been suggested that the Navy and the Army should have more freedom in putting forward specifications for new designs to fulfil their peculiar requirements, but this is the worst which has ever been said against the present system.

Whatever the future may bring forth in the way of confining the functions of the Air Force to air defence and air control, it is not in the least to be desired that responsibility for the supply of aircraft should ever be subdivided between the Ministries which rule the fighting Services. The same may be said of schools of elementary flying training. They should always remain the care of the Air Ministry. For the rest, however, co-operation between the three Services through the Committee of Imperial Defence, and certain other committees, seems the best arrangement.



LOOKING BACK : A typical Saturday afternoon scene at Hendon in 1914. Pierre Verrier is seen trying to touch with his wing tip the tin discs on top of No. 1 pylon. Another attempt succeeded. Standing on the ground is a Grahame-White "box kite"; Note the drooping ailerons. (Flight photograph).

The Outlook

A Running Commentary on Air Topics

Russia's Tragedy

NO political opinions or national prejudice can temper the sympathy one feels for Soviet Russia in the loss of the *Maxim Gorky* and of forty-eight lives. The A.N.T.15 monoplane was, to many, the epitome of a country's striving to outstrip others in technical achievement. Not only was it the largest land machine in the world, but it was made possible by public subscription and used for extensive propaganda.

That the accident should have been caused by the reckless conduct of one man while various aircraft workers were being taken on a pleasure cruise in the machine is particularly tragic. It is possible to recollect a number of occasions when, as passenger in a big machine, one has been "formatted" on by odd and sometimes gay pilots of smaller fry. This accident should give such people something to think about. One wonders, too, whether ceremonial formations which include big passenger machines ought ever to be made. A small error of judgment may have such devastating results.

Indications

IT appears that the problems of providing the pilot with the wind direction at aerodromes will never be completely solved by the use of a single type of indicator. Each one has its advantages and disadvantages, and a combination of any two would appear to be the best solution, although the smoke smudge is very nearly perfect from all points of view.

Even this, however, is sometimes liable to be misleading when used on aerodromes where mild hills and dales upset the surface air-flow. A pilot usually prefers either a smudge or a tee for obtaining the general direction during the circuit with a series of clean, coloured windsocks to give him a final check. A windsock, in any case, gives an indication both of the speed and of the particular vagaries of the wind at "hold-off" height.

One might advise all aerodrome owners to do something about it for the benefit of pilots who are coming in for the first time and in thick weather. Two elusive pieces of, perhaps, dirty rag are hardly adequate for a large aerodrome, and if windsocks alone are used they should be indicated by chalk arrows on the ground. A pilot who is busy studying obstructions and flying gaps likes to be able to take in the wind direction after one sweeping glance, and certainly does not want to make a second circuit in search of such reliable evidence.

London's Central Airport

AFEW weeks ago a member of the staff of *Flight* was flying over west London at an altitude of 3,000ft. and in conditions of almost perfect visibility. The Thames estuary was obscured in the smoke which even under those conditions could not be blown away, but Heston, Heathrow, Hanworth, Brooklands and Croydon were all in plain view.

Never could the need for a more central airport have been so obviously indicated. Crowded streets below explained every minute of the forty-odd required to travel from the West End to the present airports. Yet it was difficult to see how without a massive structure over the Thames, it would be possible to combat the difficulty. Hyde Park and Wormwood Scrubs appeared to present the only possible sites for a normal type of airport, though

Wimbledon Common would probably be considerably more convenient.

Who is to be heartless enough to suggest that such a space as Hyde Park should be put to commercial uses? The overhead airport or the perfection of underground communications appear to be the only humane solutions to the problem which, though not perhaps acute at present, is likely to become of desperate importance during the next few years.

Strange Thinking

RECENTLY every decent-minded citizen was shocked to learn that the local authorities of Stoke-on-Trent had declined to receive a visit from a squadron of the Royal Air Force on the occasion of the Jubilee, and now it is reported that the Finchley Education Committee has decided not to assist schoolchildren of the borough to see the dress rehearsal of the R.A.F. display, which will be held on the day before the Display, namely, on June 28. Schoolchildren are always admitted free to this rehearsal, every child being now intensely air-minded, it gives them all a great deal of pleasure.

It is reported that the view taken by the Finchley Education Committee is that the show tends to inculcate in children a false idea of the value of life. On this analogy, the sight of a policeman who may have arrested, or may some day arrest, a criminal and thereby bring about his execution, should also have a very bad effect on children. When will these foolish pacifists realise that the British fighting Services exist for defence, not for defiance, and that to defend one's country is one of the most elementary duties of mankind? The officers and men of the fighting Services deserve to be held in honour by their countrymen, and not least by the children.

Layer Flying

THE latest rules and regulations concerning cloud flying outside the London-Continental Airway Area bring us a shade nearer to the almost inevitable time when different classes of machine and different services will have regulated heights in conditions of bad visibility.

Though a modification only of the regulations previously in force, these virtually confine service and civil pilots, other than those practising in the recognised areas, between certain height limits. It is, however, difficult to understand why cross-country pilots without radio are kept below 2,000ft., while those with radio are also told to avoid flying between 2,000ft. and 6,500ft., above which the Service pilots may be found. One might imagine that this layer should be given to machines in regular operation and with radio so long as they were kept out of or flew at lower altitudes in the cloud-flying areas where this layer is used for practise purposes.

Before, of course, any complete layer system can be developed there must be radio stations at least for the terminal points on every air route in the country. At present the area in and around the Croydon controlled zone, for instance, can provide singular difficulties in Q.B.I. conditions. Pilots may give their height and then proceed to alter it for reasons, perhaps, of passenger comfort so the control officer really has only the vaguest idea of their exact position and height. A layer system, whereby incoming and outgoing machines on different routes were given different heights, would relieve the control of a great deal of responsibility and would generally tidy up the system.



Cavalcade of Progress : Men and Machines That Laid the Foundations of the Aviation Industry as We Know it To-day

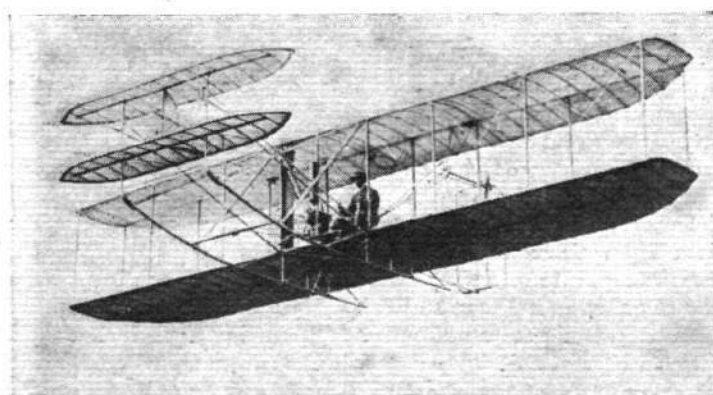
FROM hanging in the air on a woodscrew * to utilising the hidden strength of the modern cantilever wing is a long step. And from the 35 m.p.h. or so which was the speed of the Wright Brothers' biplanes in 1903 to the present world's speed record of over 440 m.p.h. is a spectacular jump. But if one has lived with the aeronautical movement throughout this time, or most of it, as has the present writer, the progress is found to have been so gradual as to have seemed at any given period almost imperceptible. Sudden jumps there have been, to be sure, but they have been relatively few and far between. In the main it has been a case of slow and steady, not to say plodding, development.

Of fundamental changes there have been few, and it is worth placing on record here the fact that the Wright Brothers, Wilbur and Orville, so far from working by rule of thumb, were most methodical in their work, and progressed from models to gliders and from gliders to power-

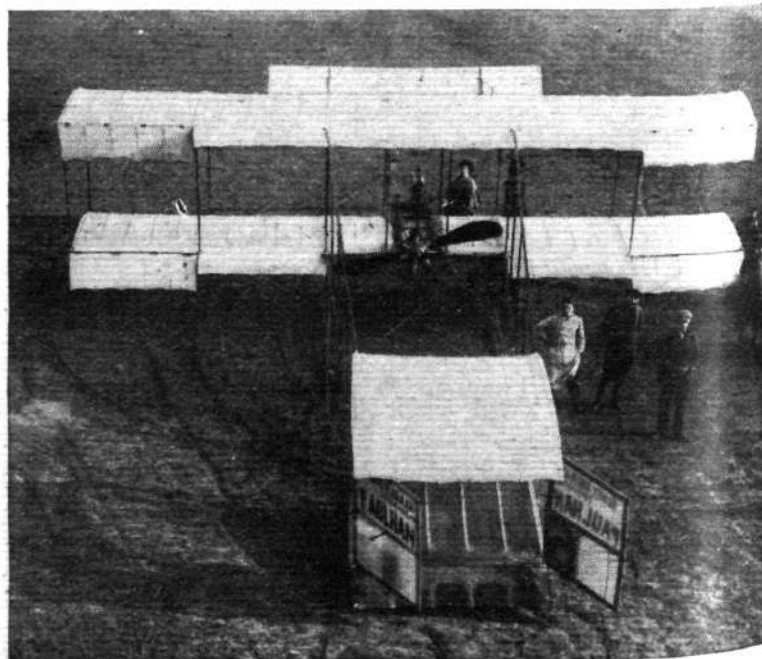
* The lift wires in the Wright biplanes were anchored to fittings secured to the spars by woodscrews.

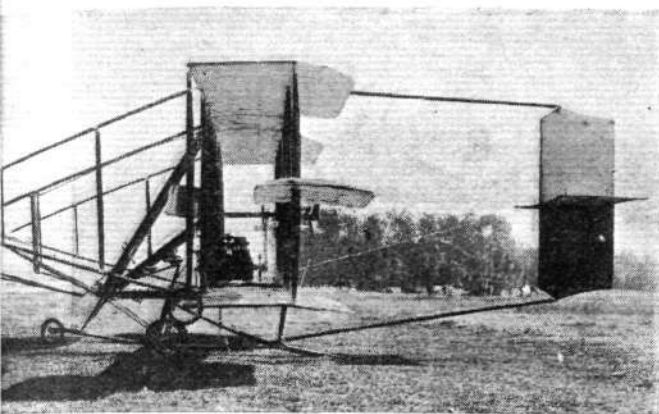
driven aeroplanes, building their own wind tunnel and testing out to the best of their ability the ideas and theories which they had formed. And even earlier, in the 'eighties in fact, Sir Hiram Maxim had experimented with airscrews and flat planes and had deduced the horse-power necessary for flight.

These notes are not intended to be a history of aviation, a subject so vast that to deal with it adequately would require many volumes. They are merely meant to recall to the older readers of *Flight*, and to introduce to the younger generation, typical examples of the machines on which our early work was carried out, and which laid the foundations for the aeroplane as we know it to-day. Even so, it is impossible to refer to all the early aeroplanes which "made history." This brief survey may, however, serve as a basis upon which to judge the general lines along

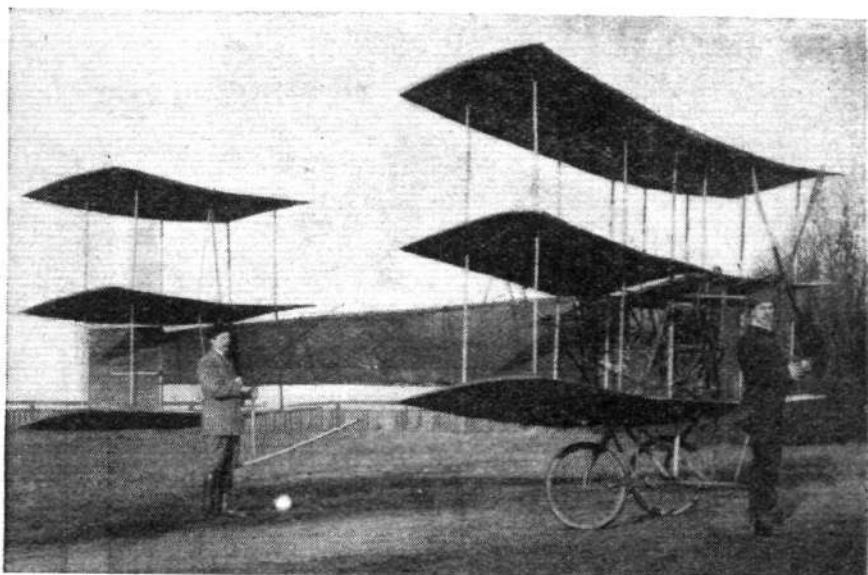


An early Wright biplane, in which the pilot sat by the side of the engine. Note the front elevators and rear rudders. On the right is the Henry Farman biplane (50 h.p. Gnome rotary engine) on which Louis Paulhan won the London-Manchester Race in 1910.





Cody's "Flying Cathedral." The engine was a 60 h.p. water-cooled E.N.V. Note the chain-drive to the pusher airscrew. Wheels were fitted to the lower wing tips. (*Flight* photograph.)



An Avro triplane with J.A.P. engine and four-bladed airscrew. Standing by the latter is Mr. (now Sir) Alliott Verdon-Roe. (*Flight* photograph.)



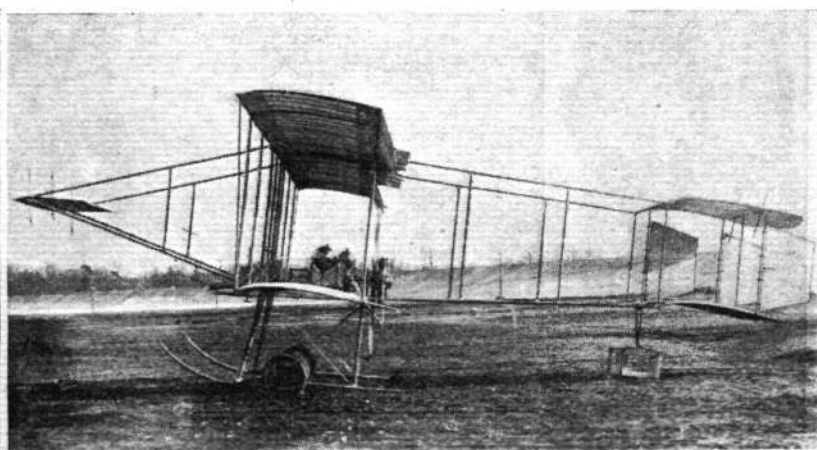
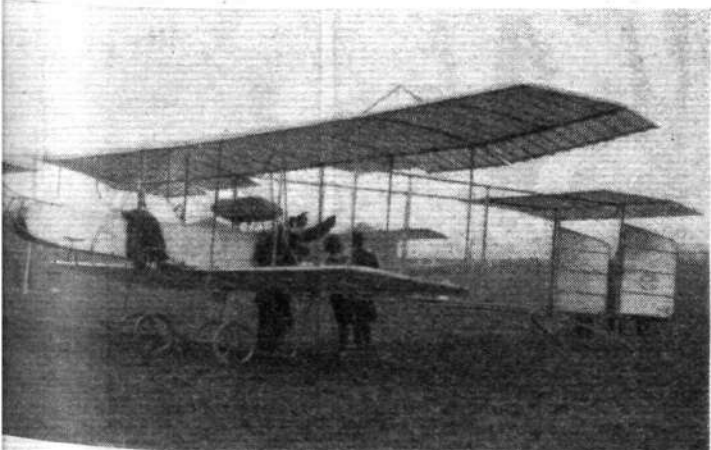
Col. Samuel Franklin Cody in the seat of one of his biplanes. Note how largely bamboo enters into the construction of the machine. (*Flight* photograph.)

which progress has taken place, and the illustrations provide plenty of interesting contrasts with the modern types shown in the pictorial supplement in this issue. The subject of power plants, which is very closely linked with the development of the aeroplane, is dealt with in another article in this issue.

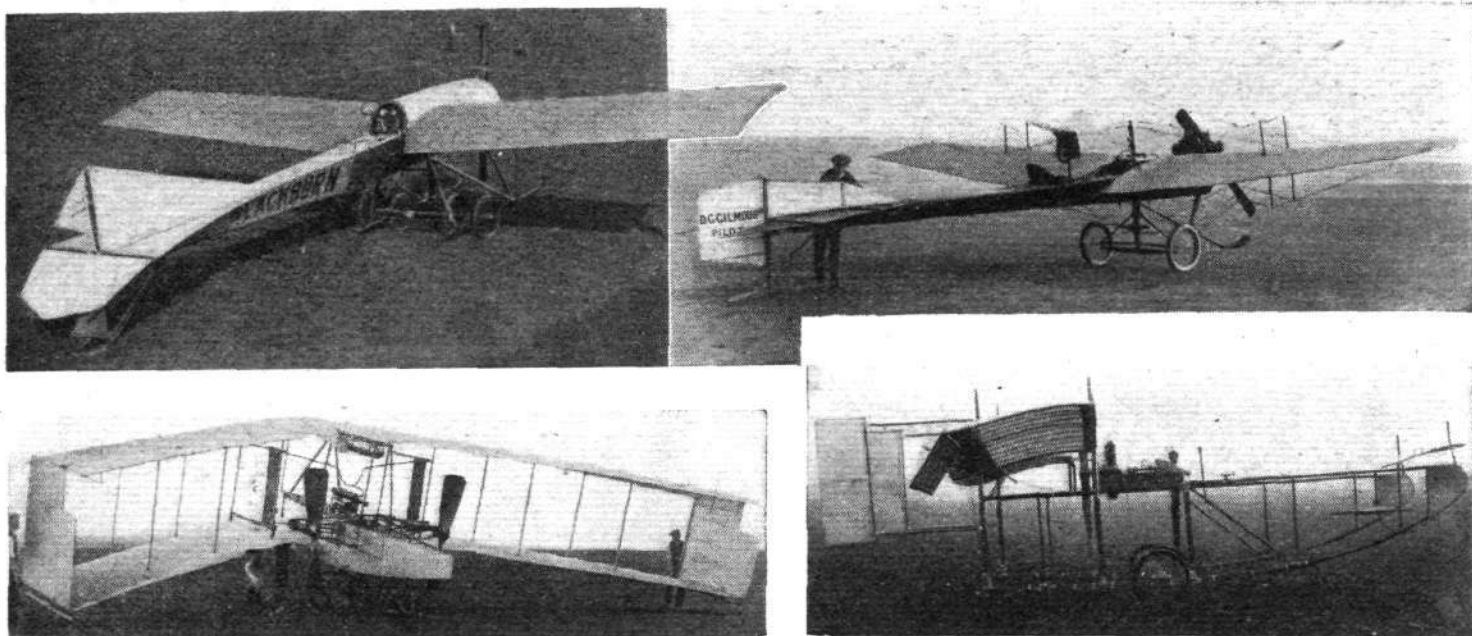
The first practical and fully-controllable aeroplane was that designed and built by the Wright Brothers, in America. From 1903 onwards the brothers continued their development work incessantly, alterations in structural or aerodynamic features being followed by test flights, and these again by further alterations. The original Wright machine underwent several modifications and detail improvements, but in the main it remained as it started, a biplane in which the pilot sat by the side of the engine on the lower wing, the engine driving two pusher airscrews by means of two chains, one of which was crossed to make the airscrews turn in opposite directions. The engine was a small water-cooled four-cylinder of about 25 h.p., and the slow-running airscrews must have been very efficient to keep the machine in the air with such low horse-power.

The original machines had vertical rudders at the back and a front elevator. The centre of gravity and centre of pressure coincided, a fact which made the machines very sensitive to elevator control. Later models of the Wright biplane had the elevator transferred to the back, a position which made the fore and aft control a little less tricky. Lateral control was by warping the wings, and the Wright Brothers had realised already in those early days that it was necessary to use the rudder in conjunction with the wing warping. To accomplish this they connected the warping and the rudder controls together.

It was not until about 1908, when the brothers came to Europe, that much was known about their machines. It was found then that they used a somewhat elaborate arrangement for taking off. This consisted in a long rail, at one end of which was erected a small tower. From



A Short pusher biplane (50 h.p. Gnome engine). The tiny front elevator, linked up to the rear elevator, was probably not very effective but it was useful to the pilot for judging the attitude of his machine. On the right a Bristol "Box kite," also with Gnome engine. In this machine the occupants were unprotected. (*Flight* photographs.)



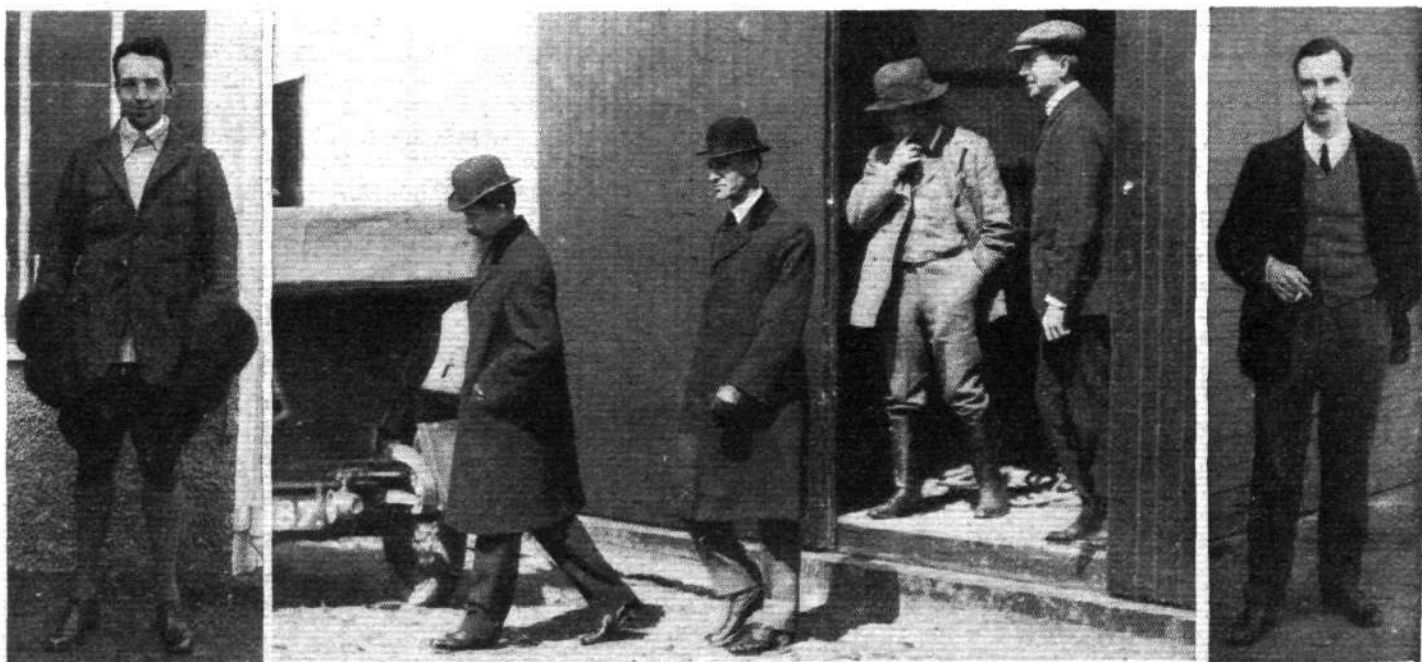
Early types : the upper left-hand photograph shows a Blackburn monoplane (50 h.p. Gnome engine), and that on the right an early Martinsyde monoplane (50 h.p. Antoinette). Note the wind shield in front of the control wheel. Of the lower pictures, that on the left shows the Dunne automatically-stable biplane (50 h.p. Green) and that on the right Horatio Barber's "Valkyrie" tail-first machine (Gnome). (*Flight* photographs.)

a heavy weight a cable passed over a pulley in this tower along the ground to the far end of the starting rail, where the cable passed over another pulley and back to the aeroplane. The pilot started his engine and, when he was satisfied with its running, moved a lever which released the weight in the tower; the machine was pulled forward along the rail and, as it reached the far end, the cable attachment disengaged automatically. By working his elevators the pilot then caused the machine to rise.

In the meantime other experimenters had been at work in Europe, notably the Farman Brothers, the Voisin Brothers and L. Blériot in France, and A. V. Roe in England. Originally the Voisin Brothers in France built pusher biplanes with biplane tails and a small front elevator, and it was on machines of this type that Henry Farman made his early flights, before he himself became a designer and constructor. These Voisin biplanes had no lateral control, but had, instead, vertical surfaces

between the wings which acted as fin area and caused the machine to right itself as soon as it began to sideslip. When Henry Farman began to design his own aeroplanes, he discarded these vertical surfaces and introduced hinged flaps on the trailing edge; in other words, the ailerons we know to-day, although in the earliest machines the ailerons on opposite sides were not interconnected, so that when the machine was standing still the ailerons hung down vertically, and did not assume their position in continuation of the trailing edge until the machine had gathered considerable headway.

Louis Blériot, almost from the very beginning, pinned his faith in the monoplane tractor type of machine, and he used wing warping for lateral control. The Blériot monoplanes were considered very pretty machines in the early days, and it was on one of these, the type XI, that in 1909 Blériot flew across the English Channel, incidentally damaging his undercarriage as he landed near Dover.



Some pioneers : on the left is an early portrait of Mr. T. O. M. Sopwith who, after piloting Howard Wright and Blériot machines, established himself as a constructor and produced a series of famous aeroplanes. The central group includes, from left to right, Orville Wright, Wilbur Wright, Horace Short, and Griffith Brewer. On the right is Mr. G. H. Handasyde. (*Flight* photographs.)

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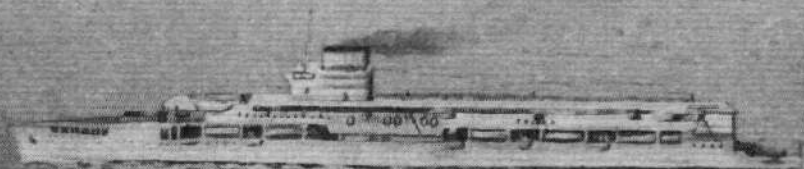
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The Handley Page monoplane (50 h.p. Gnome) which was automatically stable. On the right is a 1913 Breguet (Salmson water-cooled radial engine), one of the first all-metal aeroplanes and the first with single-spar wing construction. (*Flight* photographs.)

The engine used was a small three-cylinder air-cooled "Anzani" of about 25 h.p.

In England A. V. Roe combined, so to speak, the features of the early biplanes and the monoplane, in that he put his engine in the nose of a fuselage but used biplane and even triplane wings. The early Avro machines were designed with variable incidence wings, a feature which was, however, soon discarded in favour of fixed wings and the tail plane and elevators which have now become orthodox design. A feature of the early Avro machines was their lightness, the wing loading being only 2 or 3 lb. per sq. ft. This enabled Roe to fly with very low horsepower, and he even succeeded in getting off the ground with a J.A.P. engine of but 9 h.p. For wing covering he used a special kind of paper.

An early designer-constructor was Col. S. F. Cody, an American who had done much experimenting with man-lifting kites, and he very naturally turned his attention to aeroplanes as soon as suitable petrol engines became available. All Cody's aeroplane work was done in this country, and in time he became a naturalised British subject. He built several machines, and bamboo entered largely into the construction, the outriggers which carried the tail and front elevators being of this material. One of his machines won the Military Competition on Salisbury Plain in 1912, but was not much liked by other pilots, and it came to be held that Cody was the only man who could fly his machines really well.

Among other early British pioneers must be mentioned



Sir John D. Siddeley began his aviation career by constructing the "Puma" engine, while Mr. Hubert Scott-Paine was associated with Mr. Pemberton Billing in the production of early Supermarine flying boats. (*Flight* photograph.)

the brothers Short—Horace, Eustace and Oswald. They began their aeronautical career as balloonists and manufacturers of balloons, but as soon as the aeroplane began to show any promise they immediately turned their attention to this new type of aircraft, and the name "Short" has been prominently associated with British aviation ever since.

From building Wright biplanes under licence Short Brothers soon began to design and build their own machines. Early Short aeroplanes were of the pusher type, with a small elevator in front, and the pilot was placed in a nacelle which protected him considerably from the wind. Col. F. McClean, now Sir Francis McClean, was one of the first to learn to fly Short machines, and did immensely valuable work in encouraging others to fly. In fact, it was he who made possible the establishment of the first flying school at Eastchurch, Isle of Sheppey.

From the pusher type of aeroplane Short Brothers soon turned their attention to tractors, and of these a whole family came into being, the most famous of the early types, perhaps, being the "225," a biplane with 225 h.p. Sunbeam engine. Already, in the "pusher days," Horace Short had become interested in the possibilities of operating from the sea, and some of Col. McClean's early pusher biplanes were fitted with flat-bottomed wooden floats.



Incidents in the early days: On the left Col. (now Sir Francis) McClean is seen flying "through" the Tower Bridge on a Short seaplane. In the days before wheel brakes and chocks, machines were started in races in the manner shown above; the pilot is Marcel Desoutter and the machine a Blériot monoplane.



Mr. C. R. Fairey (left) was first connected with the construction of the Dunne automatically-stable machines, and later joined Short Brothers, and finally formed his own company. Capt. G. de Havilland began to design aeroplanes in 1910; he is seen above with Mr. F. Handley Page, at the first demonstration of the H.P. slot. On the right is Mr. H. J. Thomas, new a director of the Bristol company and chairman of the S.B.A.C., who learned to fly in 1910. (*Flight* photographs.)

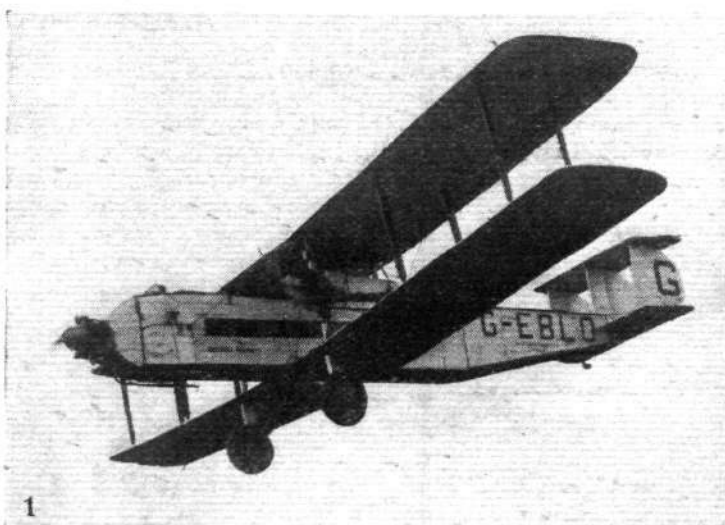
These, as we now know, were not very efficient with their flat bottoms and no steps, but the light wing-loadings used in those days, and the low alighting speeds, made it possible to make quite good use of them. From the early war period Shorts became closely associated with marine aircraft, an association which has lasted and is continuing at the present time.

Yet another British pioneer designer and constructor is Mr. Robert Blackburn. His early machines were of the monoplane type, with cable-braced wings and a fuselage of triangular section, a four-wheel undercarriage, and long skids. In spite of many failures and disappointments at the beginning, Blackburn persevered, and to-day his firm is one of the best known in the British aircraft industry. Exhibition flights on Blackburn monoplanes were made in many parts of Great Britain in the early days of flying.

While most of the early designers were preoccupied mainly with getting their machines into the air and making them controllable when once in the air, there were a few

who looked farther ahead than that, and who aimed at inherent or automatic stability. Among them was Mr. F. Handley Page, whose early monoplanes were characterised by crescent-shaped wings, tapering in thickness and chord and having back-swept tips. These Handley Page monoplanes did achieve a considerable degree of stability, but it is to be feared that pilots accustomed to the more sensitive and less stable aeroplanes of that time attempted to control the Handley Page monoplanes too much, with the result that piloting could at times be quite hard work. Had the pilots been content to leave the machines to right themselves, all would have been well, but the real merits of the designs were probably not fully realised. It is, however, worth placing on record the fact that even in the earliest days the inventor of the slot was concerned with safe flying.

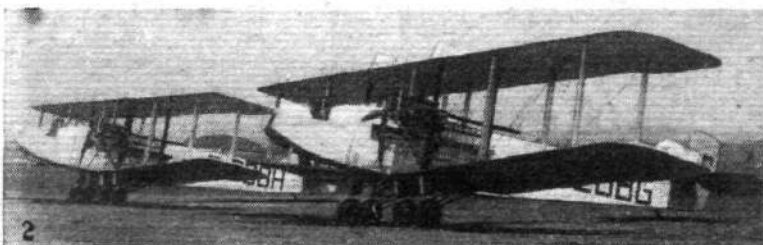
Another stability aircraft, which was to be "re-discovered" many years later, was the Dunne "tailless," in which flaps at the wing tips acted both as elevators



1



3



2



4

Four early commercial aeroplanes: (1) The Armstrong Whitworth "Argosy"; (2) the Handley Page W.8; (3) a converted D.H.4, with which commercial aviation was begun shortly after the war; (4) a D.H.34, which came into use a few years later. (*Flight* photographs.)

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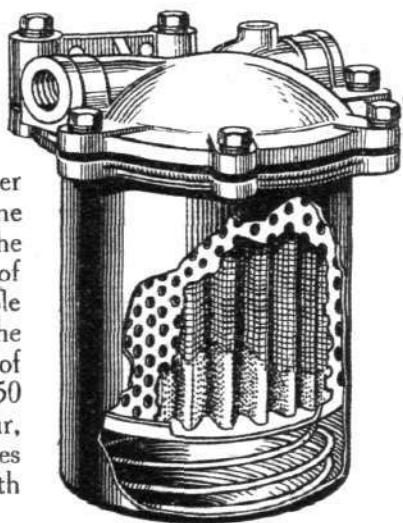
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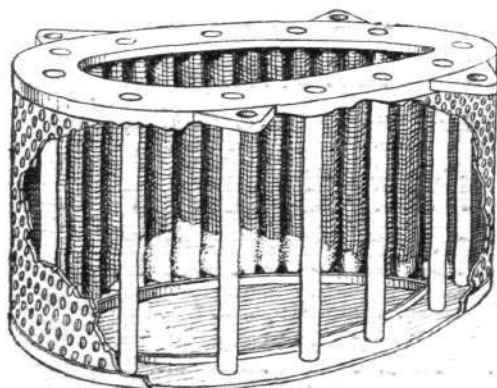
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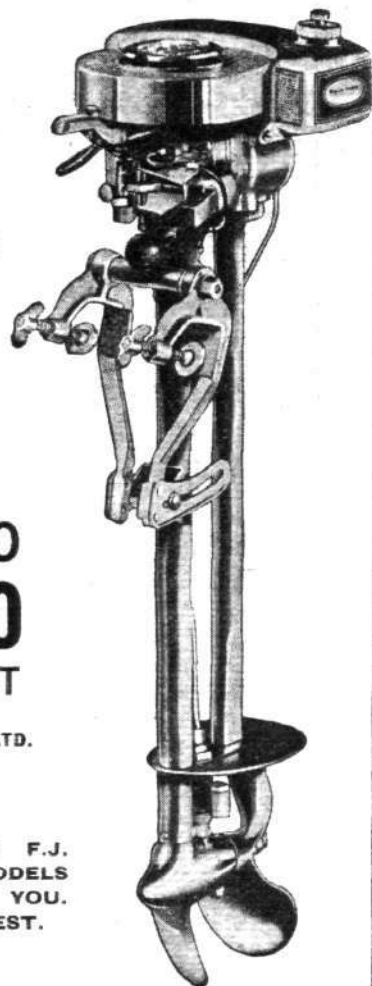
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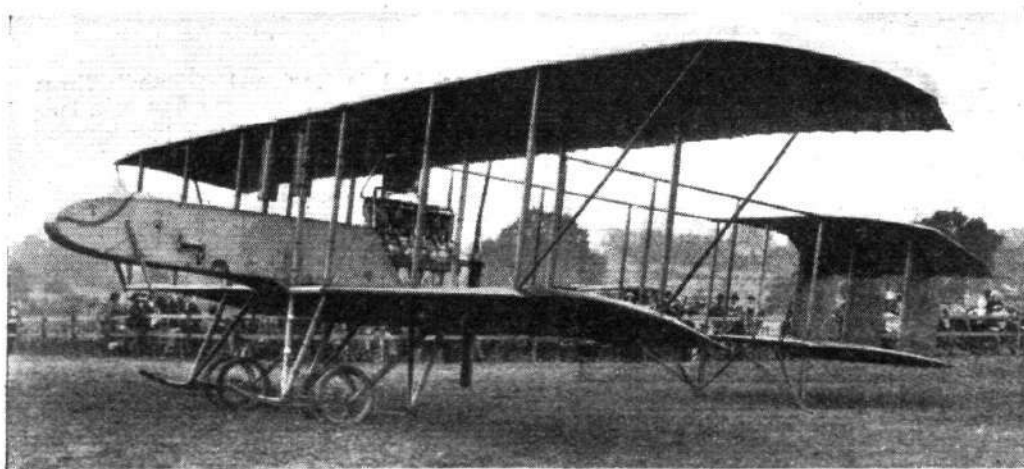


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This Grahame-White ten-seater distinguished itself shortly before the war by carrying twenty-one people from Hendon to Brooklands and back, although the Green engine was of only 100 h.p. On the right is Mr. Robert Blackburn, one of the earliest British designer-constructors, who is still busy producing aircraft for civil and military use. (Flight photographs.)



and ailerons, while steering was by rudders placed at the wing tips. The machine had a great degree of automatic stability, but was inefficient aerodynamically on account of the large number of struts and bracing wires used in its construction.

In mentioning the early British aeroplanes, those produced by Martin and Handasyde should not be forgotten. Somewhat resembling the contemporary French Antoinette monoplanes, they were always beautiful pieces of workmanship, and Mr. G. H. Handasyde remained for many years faithful to his monoplane ideal. Not until the war came did he admit the merits of the biplane, of which he then designed a considerable number, mostly very successful. Mr. Handasyde is still designing, his latest production being the B.A. "Swallow" described in *Flight* last week.

As the interest in flying grew it was inevitable that the question of flying schools should arise. The earliest pilots taught themselves, obviously; there was no one to teach them. But after a while a number of schools were established and training began in real earnest. Among the first schools were those at Eastchurch (Isle of Sheppey), on Salisbury Plain, at Brooklands and at Hendon. The machines used for school work differed considerably, but most of the early instruction was done on pusher biplanes. Shorts at Eastchurch, Bristols and Vickers on Salisbury

Plain and at Brooklands, and Grahame-White at Hendon, all used the pusher extensively for instruction work. Usually, after a certain amount of flying, the pupil would sit in front and the instructor above and behind him, from a position where, should the pupil make a serious mistake, he could reach the control stick, though not the rudder bar. On the whole there were few casualties during this early school work, probably mainly due to the very low speed of the machines used, which were mostly Henry Farmans built under (and sometimes without!) licence. The production of the 50 h.p. Gnome rotary engine really took the early aeroplanes out of the under-powered class and enabled them to fly properly.

In 1913 A. V. Roe and Co. produced the Avro 504, which was destined to become and remain the standard training type for the British Air Force for a very large number of years. The machine was a tractor biplane with 80 h.p. Gnome rotary engine, two seats in tandem inside a covered-in fuselage, and a central-skid undercarriage designed to withstand the shocks of unskilled landings. When the machine made its first appearance it was, very rightly, hailed as a great step forward, and even to-day it does not look antiquated.

As regards marine aircraft, reference has been made to the early float seaplanes made by Short Brothers. Gradually the twin-float undercarriage arrangement was



A typical incident in the life of a pioneer is shown on the left, where A. V. Roe is standing beside the wreck of one of his early machines. The figure in the centre shows "British Pilot's Certificate No. 1," Lt.-Col. J. T. C. Moore-Brabazon, President of the Royal Aeronautical Society. On the right the Hon. C. S. Rolls by one of his early Wright aeroplanes. He was killed through his elevator breaking off. (Flight photographs.)



First produced in 1913, the Avro 504 shown above became and remained the standard training machine of the R.A.F. until a few years ago. The engine of the original machine was an 80 h.p. Gnome rotary. (*Flight* photograph.)



The original de Havilland "Moth" (Cirrus engine), seen below, was the first of a long line of light aeroplanes. (*Flight* photograph.)

adopted by other constructors, and in time the float with vee bottom and one or two steps came into use, the step facilitating the take-off and the vee bottom reducing landing shocks.

The single-hull flying boat came later than the twin-float seaplane. One of the first companies to introduce this type of machine was the Curtiss company of America. Lieut. J. C. Porte, R.N., secured the British rights for this type, and from it developed during the war a series of flying boats known as the "F" type.

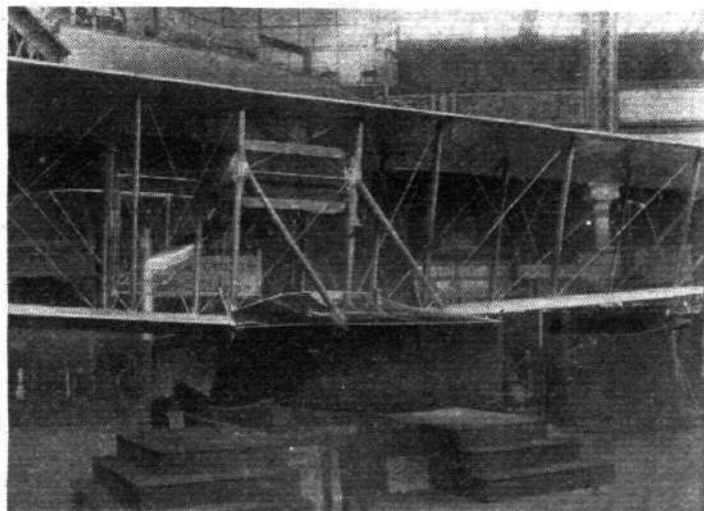
In 1913 Mr. Noel Pemberton Billing founded the Supermarine Aviation Works at Southampton, and at the aero show at Olympia next year he exhibited a small flying boat in which the rounded sections and curved sides foreshadowed yet another "family" of flying boats, the Linton Hope type.

The "Bat Boat"

Earlier still the Sopwith Aviation Company had produced the so-called "Bat Boat," in which the tail was carried not on the hull itself, which was quite short, but on tail outriggers. A single engine driving a pusher airscrew was mounted in the gap between the wings, and the occupants sat near the nose of the hull. One of these machines, with a retractable undercarriage, was the first British amphibian flying boat, and on it Mr. Harry Hawker won the Mortimer Singer Prize by taking off from and alighting on land and water alternatively.

All these seaplanes and flying boats had floats and hulls of wood construction. One disadvantage of this was that

the wood, no matter how carefully varnished, soaked up a considerable quantity of water. It was not until metal construction was introduced, several years after the war, that this trouble was overcome, and the flying boat as we know it to-day could compete with the aeroplane in the matter of efficiency.



The Sopwith "Bat Boat" exhibited at Olympia in 1914 was one of the earliest British flying boats. The engine was a 200 h.p. Salmson Canton-Unné 14-cyl. water-cooled radial. (*Flight* photograph.)

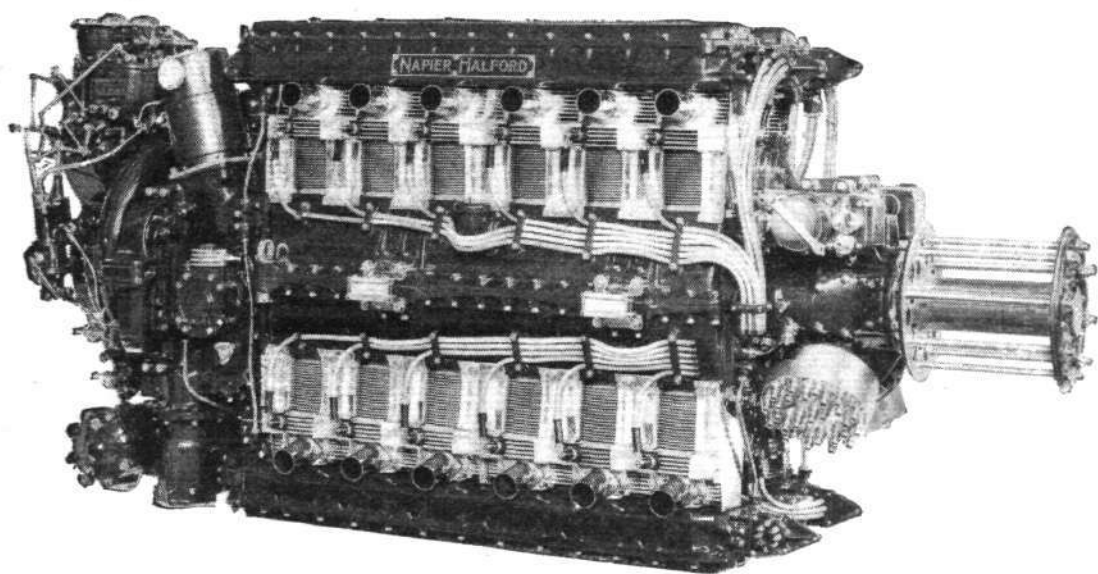
Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in this list.

- May 23. Jubilee Air Ball, Air League of the British Empire, at the Dorchester Hotel, London.
- May 25. Empire Air Day, Air League of the British Empire.
- May 29. Household Brigade Flying Club. Night-Flying Demonstration, Heston.
- May 30. Wilbur Wright Lecture, by Mr. Donald W. Douglas, Science Museum, South Kensington.
- June 1. Brooklands "At Home."
- June 1-15. Lisbon Aero Show.
- June 7-11. Whitsun Flight through Austria, Oesterreichischer Aero Club.
- June 8. London Aeroplane Club. Garden Party, Hatfield.
- June 8. Official opening and garden party, Witney and Oxford Aero Club.
- June 15. R.A.F. Flying Club Annual Display, Hatfield.
- June 15. Bristol and Wessex Aeroplane Club, S.B.A.C. Challenge Cup, Whitchurch.
- June 16. Scottish Flying Club Display, Renfrew.
- June 29. Royal Air Force Display, Hendon.
- July 1. S.B.A.C. Display, Hendon.

- July 6. Royal Air Force Fly-past before H.M. the King at Duxford.
- July 7. Douze Heures D'Angers, Aero Club de France.
- July 13. Opening of Leicester Municipal Airport.
- July 20. Opening of Brighton, Hove and Worthing Municipal Airport, Shoreham.
- July 20-21. Coupe Armand Esders, Aero Club de France.
- July 28. Private Owners' Garden Party, Ratcliffe, Leicester.
- Aug. 17. Round the Isle of Wight Air Race and Portsmouth Air Trophy.
- Aug. 24-25. Third International Flying Meeting, Lympe.
- Aug. 24-25. Cinque Ports Club. International Flying Meeting and Wakefield Cup Race.
- Aug. 24-30. Raduno del Littorio, Rome. Reale Aero Club d'Italia.
- Sept. 4-18. Jungtrauoch Concours, Aero Club de Suisse.
- Sept. 6-7. King's Cup Air Race.
- Sept. 14. Cinque Ports Club. Folkestone Aero Trophy Race.
- Sept. 15. Gordon Bennett Balloon Race, Warsaw.
- Oct. 12-28. International Aircraft Exhibition, Milan.

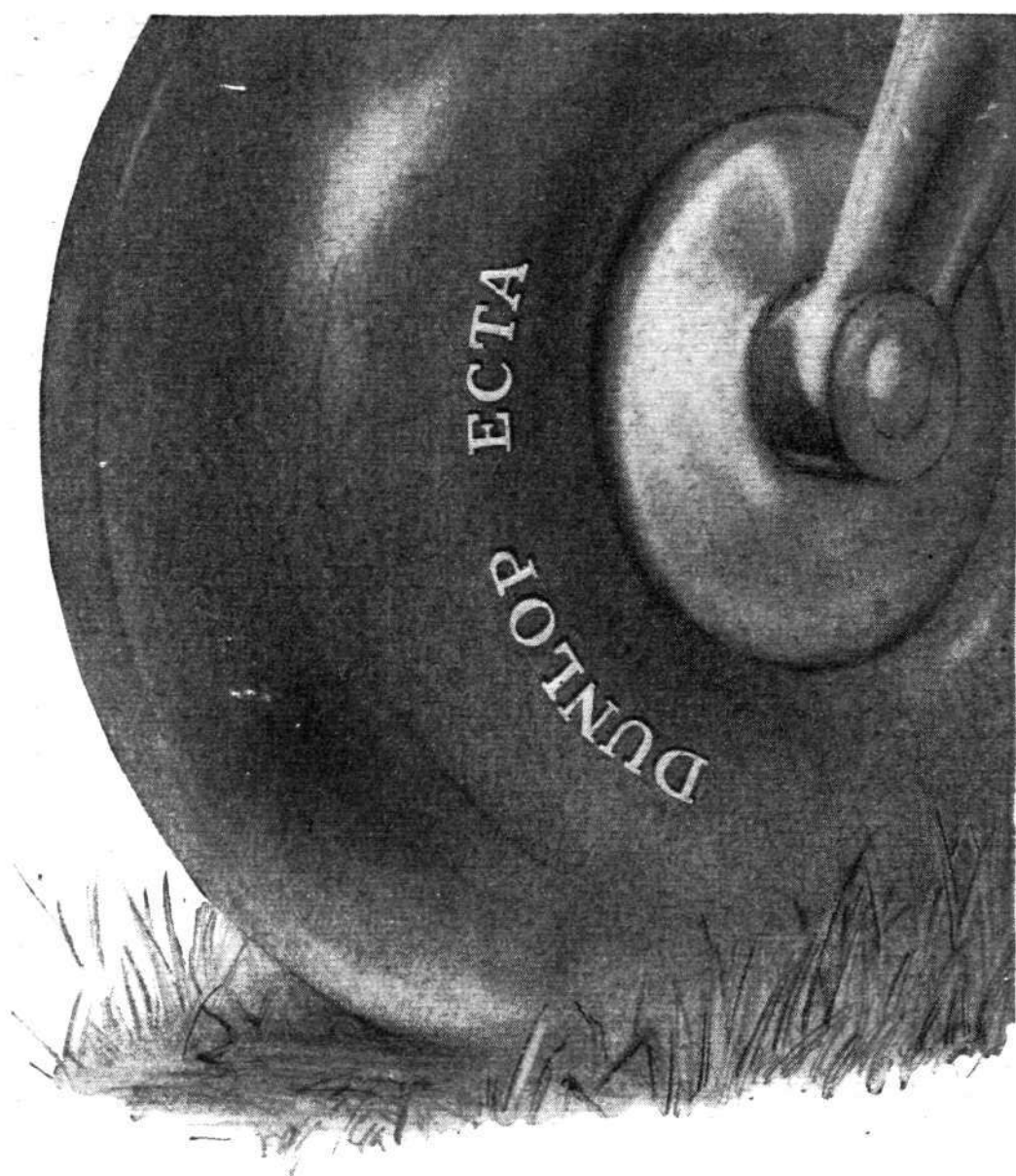
Dagger



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THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

Death of Col. Lawrence

It is with deep regret that *Flight* places on record the death of Col. T. E. Lawrence, or, as he was known during his R.A.F. service, Aircraftman Shaw.

Belfast-built Bellancas

It is now stated that a site has been purchased in Belfast for the erection of a factory which will construct Bellanca machines under licence.

On Equal Terms

Flying the same D.H. "Puss Moth" in which J. Melrose broke the round-Australia record with his time of 5 days 11 hours, H. F. Broadbent has made the trip in 3 days 9 hr. 54 min., or 2 days 1 hr. 6 min. less.

Hence the String

An 8½ lb. practice bomb, accidentally dropped from an aeroplane, landed on the lawn of a sanatorium near Lincoln. Therein probably lies the explanation of the string which is sometimes seen bound round the bombs and racks of R.A.F. machines.

The Ubiquitous "47"

It has been disclosed that the Handley Page 47 General-Purpose monoplane (see *Flight* of April 18) can transport four soldiers if necessary. A collapsible dinghy is stowed in the wing (which, incidentally, has a single spar), and flotation gear is carried.

London-Paris on Six Shillings

That the little B.A.C. "Drone" with its 600 c.c. Douglas engine is no mere fine-weather toy was forcefully demonstrated by Mr. Robert Kronfeld last week. He ferried one of these machines from Croydon to Le Bourget in bad weather in a little over four hours. His fuel bill came to six shillings. The average speed for the 235-mile trip works out at 56.4 m.p.h., despite the strong head wind and "icing up" experienced over the Channel.

Getting Away With It

The superb airmanship of Sir Charles Kingsford-Smith, and the amazing pluck of his navigator, Mr. P. G. Taylor, have saved the veteran Avro Ten *Southern Cross*. On a mail flight between Australia and New Zealand a piece of broken exhaust pipe shattered the starboard airscrew. After turning back towards Sydney the port engine threatened to fail, so Mr. Taylor made six trips along the wing carrying oil in a thermos flask and feeding it to the engine. About eight hours after the first mishap occurred land was sighted, and "Smithy" put the machine down safely. Mr. Stannage, the wireless operator, sent messages throughout the ordeal.



IT COULDN'T BEAT THE "DRONE."

As reported on this page, rain and generally dirty weather failed to prevent Mr. Kronfeld reaching Paris in the "Drone." Here the tiny machine is seen just prior to starting from Croydon.

Young Pilots' Fund Opportunity?

"I'll have a ride in a train to Dublin. Then I'll try one of those motor cars. And then, begorrah, it's myself who'll be after trying to go up in an aeroplane."—Reported comment of a 105-year-old Irishman who came into a fortune of £10,000 last week.

Welcome!

Mr. Donald W. Douglas, president of the Douglas Aircraft Company, has arrived in this country, at the invitation of the Royal Aeronautical Society, to give the Wilbur Wright Lecture.

An "Aerodrome Warming"

Several autogiros, in addition to some fifty other aeroplanes, brought seventy guests to a garden party given last Saturday by Mr. J. M. Bickerton on his new private aerodrome at Owls Oak, Denham, Bucks.

Ambitious

Leading Hollywood film stunt pilots are to come to London this summer to take part in a film, "The Conquest of the Air." Mr. John Monk Saunders, who wrote "Wings" and "The Dawn Patrol," and who will direct the new film, says that there will be no thread of fiction; only actual events will be depicted. The British, American, French, German and Italian Governments are reported to be co-operating.

Twenty-five Years Ago

(From "*Flight*" of May 21, 1910.)

"Messrs. Piggott Bros.' aeroplane is of great size, for it has a span of no less than 60ft. and is designed for carrying one or more passengers in addition to the pilot. . . . Possibly the outstanding feature is the extensive use of aluminium. The main planes and supplementary surfaces are all carried upon a central framework that is for the most part constructed of this material."



STABLED: The Caudrons entered for the Coupe Deutsch Race flown last Sunday, being groomed in their hangar.

EMPIRE AIR DAY

A Guide for Intending Visitors to the Various Service and Civil Aerodromes Which Will be Open to the Public Next Saturday

NEXT Saturday will be a memorable one for thousands of members of the general public who feel an inclination to satisfy their curiosity about aviation. That day is Empire Air Day, and the public will be allowed to look behind the scenes at civil and military aerodromes, and in aircraft and aero engine factories. In addition, the Day, which has been organised by the Air League of the British Empire with the support of the Air Ministry, should enable those who have not experienced the joys and usefulness of flight to make short air trips or journeys to various parts of the country at very much reduced rates.

Admission to the various aerodromes and works can be gained in many cases for nothing, and in others on payment of a few pence. At Service aerodromes visitors will see Squadrons or experimental units performing their every-day work, although, in several instances, special demonstrations have also been arranged. Full details of the majority of programmes will be found in the guide set out below.

The Air League has produced a very creditable souvenir booklet in connection with the Day. The foreword is by Lord Londonderry, who appeals to all in this country to support Empire Air Day, and thus help to forward both the security of the Empire and the cause of peace, and contributors include Sir Philip Sassoon, Capt. G. de Havilland, Sir Harry Brittain, Sir A. V. Roe, Air Commodore J. A. Chamier, and experts on various phases of flying. The booklet will be published on Saturday, price 6d.

Newer readers of *Flight* who are unfamiliar with the appearance of the leading types of aircraft will find the interest of Empire Air Day demonstrations enhanced if they take with them the special pictorial supplement which appears in this issue of *Flight*, and which contains illustrations of a number of the machines which will be seen at the various aerodromes; these include the Avro "Tutor," Autogiro, Short "Scion," Hawker "Hart" and "Fury," D.H. "Leopard Moth," Miles "Falcon," Handley Page "Heyford," and Boulton Paul "Overstrand."

SERVICE AERODROMES

England

BEDFORDSHIRE: *Henlow*.—Work of the Home Aircraft Depot.

BERKSHIRE: *Abingdon*.—Nos. 15 and 40 Bomber Squadrons: Dive bombing by "Harts" of No. 15 Squadron on an aerodrome target; formation take-off and landing by "Gordons" of No. 40 Squadron—this latter Squadron will make formation flight over Witney (Oxon) and Reading (Berks.) aerodromes at about 4.25 and 4.55 p.m.; aerobatics on "Tutor" and slow landing demonstration; machine-gun testing and exhibitions of signalling, photographic equipment, parachutes, etc.

BUCKINGHAMSHIRE: *Hallon*.—Work of School of Technical Training for Aircraft Apprentices, Princess Mary's R.A.F. Hospital and R.A.F. Pathological Laboratory: post-war barracks; practice flying.

CHESHIRE: *Sealand*.—No. 5 Flying Training School: Formation of 24 aircraft ("Atlas," "Tutor" and "Bulldog") will pass over Speke Airport, Liverpool, at 10 a.m. and 1 p.m. and over Hooton Park a few minutes later; hangars, armoury, the institute, parachute and meteorological sections, workshops, etc., on view; parade of aircraft.

DEVONSHIRE: *Moortown*.—Work of Nos. 204 and 209 Flying Boat Squadrons ("Southampton" and "Perth").

DURHAM: *Castletown*.—No. 607 (County of Durham) Bomber Squadron: Flying training, formation flight and cross country flight; wireless communication between air and ground; mock air battle and attack on ground target with camera guns; parachute, wireless and photographic sections, hangars, armoury, operations room, etc., will be open; "Wapitis," "Avros" and "Moths" on view.

ESSEX: *Hornchurch*.—Nos. 54 and 65 Fighter Squadrons ("Bulldog" and "Demon"). *North Weald*.—Nos. 29 and 56 Fighter Squadrons. Mock air fight and "interception." Attacks on ground targets, aerobatics, message dropping. Machines: "Demon," "Bulldog," "Moth."

GLOUCESTER AND SOMERSET: *Filton (Bristol)*.—Work of No. 501 (City of Bristol) Bomber Squadron, Special Reserve ("Wallace").

HAMPSHIRE: *Gosport*.—Coast Defence Training Flight: Deck landing practice, formation flying, mock torpedo attacks; lectures on torpedoes; aerobatics and a dive bombing attack; machines on exhibition: "Vildebeest," "Nimrod," "HIF," "Hart," "Seal," "Osprey," and "Shark"; demonstration of anti-gas measures, synchronising gear, guns, bombing apparatus, etc.; wireless communication between aircraft and ground. *Worthy Down*.—Work of Nos. 7 and 58 Heavy Bomber Squadrons ("Virginia"). *Farnborough*.—Royal Aircraft Establishment: School of Photography, No. 4 (A.C.) Squadron. *Lee-on-Solent*.—Work of School of Naval Co-operation (Seaplane Station). *Calshot*.—No. 201 Flying Boat Squadron ("Southampton") and Flying Boat Training Squadron ("Cloud"): Flying boat, seaplane, and amphibian training; formation flying, launching, mooring, etc. Machines: "Southampton," "Cloud," "Osprey," "Seal," and "Tutor"; trips in high-speed motor boats; armoured target boats on view.

KENT: *Biggin Hill*.—Nos. 23 and 32 Fighter Squadrons ("Demon" and "Bulldog"): Air drill and fly-past, aerobatics, attack on towed target, message



A Martlesham pilot gets ready for a 20,000-foot full-load climb in the new Handley Page general-purpose monoplane. Note the aneroid strapped to his knee. Martlesham Heath, like two score other Royal Air Force stations, will be open to public inspection on Saturday.

dropping, and forced landing practice; armoury, workshops, barracks, parachute room, hangars, etc., will be open. *Easchurch*.—Armament Training School: Parade of "Harts," "Bulldogs," "Wapitis" and "Gordons"; bombing of camera obscura and Hill's mirrors, supply dropping, and high-altitude bombing; mock battle with camera guns between fighters and bombers; camera-gun attack on aerodrome; guns, bombs, "bombing teacher," etc., on view. *Hawkinge*.—No. 25 Fighter Squadron ("Fury"): Flying training and manoeuvres by "Furies"; storage section, hangar, armoury, parachute section, butts, etc., on view. *Manston*.—No. 500 (County of Kent) Heavy Bomber Squadron Special Reserve ("Virginia"); School of Technical Training (Men); Station Headquarters, No. 2, Army Co-operation Squadron ("Audax"); Formation of "Virginias" and "Atlases" will fly over Canterbury aerodrome at 3.15 and 5.15. Demonstration of fire fighting, anti-gas measures, parachute packing, etc. Machines: "Audax," "Atlas," "Moth," "Virginia."

LINCOLNSHIRE: *Digby*.—Work of No. 2 Flying Training School. *Grantham*.—No. 3 Flying Training School: Demonstrations of flying training, aerobatics, parachute packing, anti-gas training, fire drill, and "bombing teacher" instruction; guard mounting display, and lowering the Ensign. Machines: "Atlas," "Bulldog" (dual and solo), "Tutor." *Waddington*.—Work of No. 503 (County of Lincoln) Heavy Bomber Squadron, Special Reserve ("Hinaidi"). *Cranwell*.—R.A.F. Cadet College and Electrical and Wireless School: Aerobatics by "Hart"; a "Tutor" will pick up a message, and two "Tutors" will demonstrate flying instruction; formation of three "Harts," aerobatics by "Bulldog," formation of 7 or 9 "Tutors"; wireless communication between air and ground; anti-gas drill, and demonstration of "Valentia" flying class-room for wireless instruction; case of beer to be dropped by parachute from "Hart" for sale for charity; exhibition of equipment.

MIDDLESEX: *Hendon*.—Work of No. 600 (City of London), No. 601 (County of London), and No. 604 (County of Middlesex) Fighter Squadrons, A.A.F. ("Hart" and "Wapiti"). *Northolt*.—Nos. 41 and 111 Fighter Squadron ("Demon" and "Bulldog") and No. 24 Communications Squadron ("Moth," "Osprey" and "Hart"): Programme illustrating flying training; exhibitions of "Wallace," "Hart," "Avro," "Moth," and "Tomtit" aircraft, oxygen and gas apparatus, machine guns, etc. Flight of aircraft will demonstrate flying training over Hanworth and Heston.

NORFOLK: *Bircham Newton*.—Work of Nos. 35 and 207 Light Bomber Squadrons ("Gordon").

NORTHAMPTON: *Wittering*.—Central Flying School: Flight practice by three "Bulldogs" and five "Tutors"; inverted flying by the latter; aerobatics by "Bulldog" and "Fury"; machines: "Bulldog," "Tutor," "Fury," "Avro," "Atlas," "Heyford," "Hart"; demonstration of anti-gas training; workshops, hangars, parachute and navigation sections, rifle range, etc., will be open.

NOTTINGHAMSHIRE: *Hucknall*.—No. 504 (County of Nottingham) Light Bomber Squadron, Special Reserve ("Wallace"); displays of blind-flying instruction, photography, and flight formation flying; attack on a towed target, and camera obscura practice; machines: "Wallace," "Avro."

OXFORDSHIRE: *Upper Heyford*.—Work of Nos. 18, 33 and 57 Light Bomber Squadrons ("Hart"). *Bicester*.—No. 101 Medium Bomber Squadron: Aero-



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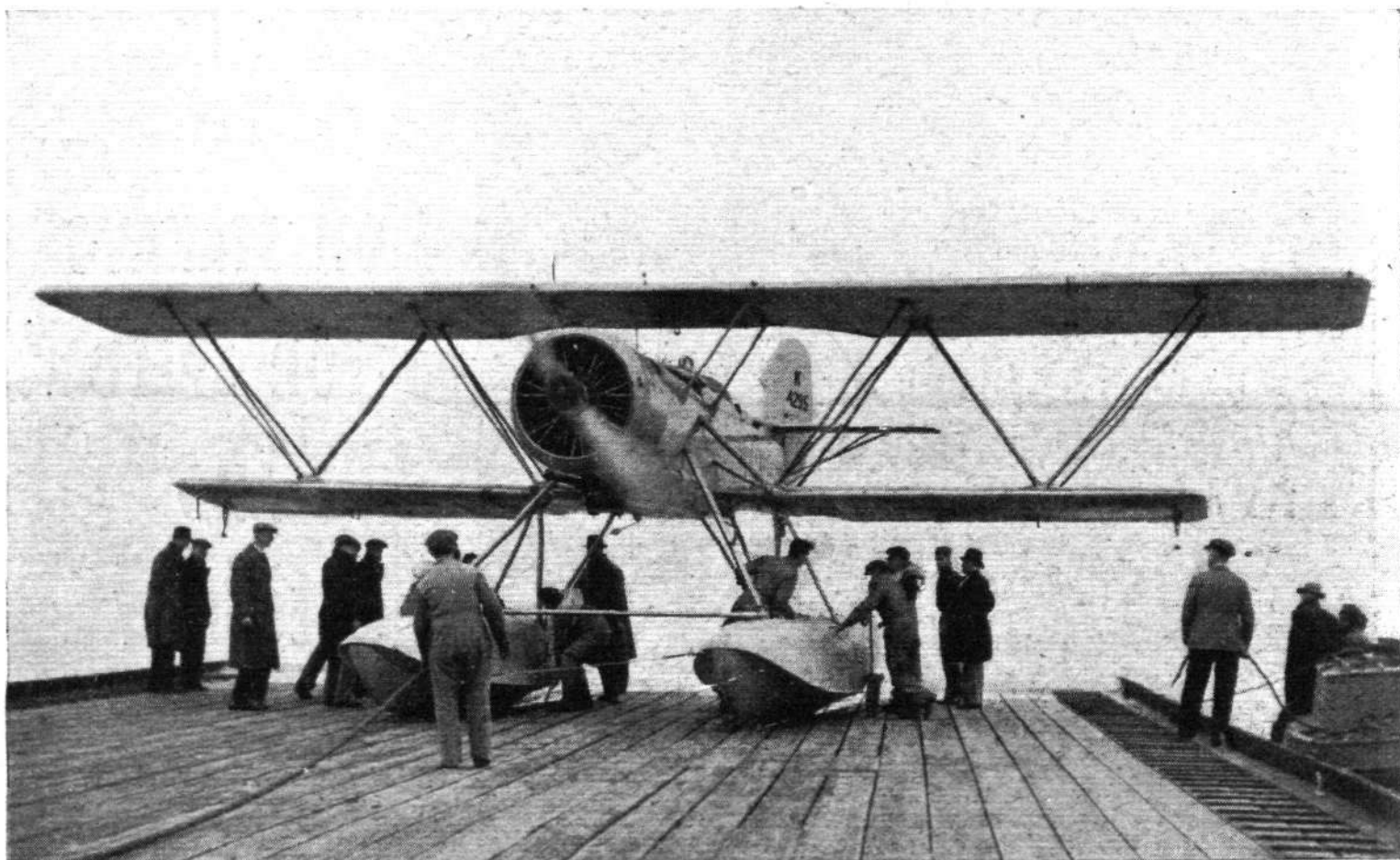
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batics by "Moth," and camera-gun practice against aerodrome targets by "Sidestrand" or "Overstrand"; low-altitude bombing by "Overstrand"; a flight of "Harts" of No. 33 (Bomber) Squadron from Upper Heyford will make a dive bombing attack on an aerodrome target, landing afterwards for inspection; No. 57 (Bomber) Squadron will give a display of air drill; display of night flying organisation; machines: "Overstrand," "Sidestrand," "Hart," "Moth"; displays of equipment, armament, parachutes, etc.

SUSSEX: *Marlborough*.—Aircraft and Armament Experimental Establishment: Flying by experimental types of Service and civil aircraft, including D.H. "Comet," Northrop Bomber, Autogiro, and Handley Page G.P. monoplane; various sections (armament, instruments, workshops, etc.) will be open; display of "bombing-up"; stripped machines on view. *Felixstowe*.—Marine Aircraft Experimental Establishment: Experimental and practice flying by large flying boats and floatplanes; large 50-ton crane capable of handling big flying boats. "Fly past"; bomb loading; aerobatics; fight between "Nimrod" and "Osprey" machines; "Singapore," "Perth," Supermarine Mk. V., "Southampton."

SURREY: *Kenley*.—Nos. 3 and 17 Fighter Squadrons ("Bulldog"): Both Squadrons will "go into action" on receipt of information that bombers are approaching; "battle" between fighters and bombers; attacks on towed targets, and low flying attacks; visitors will be allowed to "shoot" low-flying aeroplanes with camera guns; both squadrons will pass over Redhill and Gatwick during the afternoon; aerobatics and forced-landing practice; hangars, repair sections, armoury, living quarters, etc., to be open for inspection; machines: "Bulldog," "Hart," "Tiger Moth."

SUSSEX: *Tangmere*.—Nos. 1 and 43 Fighter Squadrons ("Fury"): Flying by Hawker "Furies" of both Squadrons; aerobatics by individual machines; "Quick get-away" by No. 43 Squadron, followed by a visit to Ford (2.55 p.m.), Shoreham (3.10 p.m.) and Wilmington (3.30 p.m.), returning to land in formation; camera-gun practice and message dropping by three aircraft; aerobatics by one machine, during which pilot will broadcast description of manoeuvres; Air drill by No. 1 Squadron, using radio telephony; two mock air battles; mass formation flight by Battle Flights of both Squadrons demonstrating "quick get-away" and climb to 6,000 ft.; hangars, barracks, repair section, parachute section, etc., will be open; machines: "Hart," "Fury," "Moth."

WARWICKSHIRE: *Castle Bromwich*.—No. 605 (County of Warwick) Light Bomber Squadron, A.A.F. ("Wapiti"): Wireless, gunnery, bombing and photographic exercises; squadron formations and drill; individual aerobatics; bombing practice with camera obscura; stripped aircraft; wireless and photographic sections, workshops, armoury, etc., to be open; machines: "Hart," "Moth."

WILTSHIRE: *Boscombe Down*.—Nos. 9 and 10 Heavy Bomber Squadrons ("Virginia" and "Heyford"): Bombing practice, air navigation, army co-operation, anti-aircraft, and searchlight exercises; camera-gun practice; machines: "Virginia," "Heyford"; hangars, parachute room, meteorological section and armoury will be open. *Old Sarum*.—No. 16 Army Co-operating Squadron ("Audax") and School of Army Co-operation: Picking-up messages, diving attacks by machines using camera guns, radio telegraphy demonstration, supply dropping, and close reconnaissance; flying by "Rotas," "puff" shoots, vertical photography; armoury, hangars, workshops, signal and photographic sections to be open. Machines: "Audax," "Rota"; flights of "Audaxes" will visit Bournemouth and High Post aerodrome, twice during the day; a "picture" instructional target will be on view. *Larkhill*.—Balloon Training Centre: Balloons will be taken in and out of hangars, and process of producing hydrogen gas will be explained; a balloon will ascend and will be controlled and lowered; demonstration of how a balloon is transferred over telegraph wires, and moved across country; dummy parachute descent. *Netheravon*.—Work of Fleet Air Arm Units and No. 13 Army Co-operation Squadron ("Audax"). Display by nine "Tutors." Machines: "Audax," "Tutor."

YORKSHIRE: *Catterick*.—Work of No. 26 (Army Co-operation) Squadron ("Audax"). *Thornaby*.—Work of No. 608 (N. Riding) Light Bomber Squadron Auxiliary Air Force ("Wapiti").

Scotland

FIFE: *Leuchars*.—Work of Training Base for Fleet Air Arm.

RENFREWSHIRE: *Abbotsinch*.—No. 602 (City of Glasgow) Light Bomber Squadron Auxiliary Air Force ("Hart"): Aerobatics, mock air fights, bombing practice camera-gun practice, blind flying instruction; formation flying, machine-gun firing at stop butts. Communication by wireless telephony between aircraft and ground. Hangar, machine-gun butts, barracks, meteorological section, etc., to be open; parachute packing will be demonstrated; machines: "Hart," "Avro," "Moth"; stripped machine in hangar fitted with bombs, wireless and full equipment.

MIDLOTHIAN: *Turnhouse*.—Work of No. 603 (City of Edinburgh) Light Bomber Squadron, A.A.F. ("Hart"): Aerobatics, "air battle" and air drill. Some details of the work of this Squadron will be found in a special article in this issue.

Wales

PEMBROKESHIRE: *Pembroke Dock*.—Work of No. 210 (Flying Boat) Squadron, and No. 230 (Flying Boat) Squadron; R.A.F. floating dock. Fight between "Osprey" and "Southampton"; much of station open.

Northern Ireland

Co. ANTRIM: *Aldergrove*.—Work of No. 502 (Ulster) Heavy Bomber Squadron, Special Reserve ("Virginia").

CIVIL AERODROMES

England

BERKSHIRE: *Reading*.—Reading Aero Club: Aerodrome open all day; Phillips and Powis works, which manufacture Miles "Hawk," "Falcon" and "Merlin" machines, open from 2-3 p.m.

GLOUCESTER AND SOMERSET: *Bristol*.—Bristol and Wessex Aeroplane Club: At least four machines available for joy rides; several private owners will probably attend.

HAMPSHIRE: *Southampton (Eastleigh)*.—Hampshire Aeroplane Club: Joy riding; half-fare services to London and other centres by Provincial Airways, Ltd. *Portsmouth*.—Airspeed (1934), Ltd., is co-operating and Provincial Airways, Ltd., are offering half-fares.

KENT: *Gravesend*.—Airport open, Gravesend Aviation, Ltd., co-operating. *Canterbury (Bekesbourne)*.—Kent Flying Club co-operating, aerodrome open. *Lymington*.—Cinque Ports Flying Club co-operating, aerodrome open. *Tonbridge Wells*.—Miss Pauline Gower, of Air Trips, Ltd., will give joy rides in a Spartan three-seater.

LANCASHIRE AND CHESHIRE: *Manchester*.—Manchester Airport, with its hangars and workshops, will be open to public inspection during Empire Week; Lancashire Aero Club is co-operating; there will be joy riding in Avro "Cadets" and an Autogiro. *Liverpool*.—Liverpool and District Aero Club will give flying facilities at this airport and at Hooton Park, Cheshire; Blackpool and West Coast Air Services Ltd., will give pleasure flights at 2s. 6d. a head.

LEICESTERSHIRE: *Leicester (Braunstone)*.—Municipal Airport open, and Leicester-shire Aeroplane Club co-operating; private owners of the County invited; joy flights at cheap rates.

MIDDLESEX: *Hendon*.—Airport open: Airwork, Ltd., co-operating; Henlys, Ltd., giving flights in a Short "Scion" to be flown by Capt. Birkett, of Birkett Air Service, Ltd., which firm will reduce joy ride fares from 5s. to 4s. *Hanworth*.—Aircraft Exchange and Mart, Ltd., co-operating; private owners with their own pilots are being asked to allow pilots to be free to operate Company's aircraft.

NORTHUMBERLAND: *Newcastle-upon-Tyne (Cramlington)*.—Newcastle-upon-Tyne Aero Club co-operating: Joy riding in "Gipsy Moths."

NORFOLK: *Norwich*.—Aerodrome open, flying club co-operating: cheap joy rides. NOTTINGHAMSHIRE: *Nottingham*.—Airport open; Nottingham Airport and Flying Club, Ltd., offering joy rides at 2s. 6d.

OXFORDSHIRE: *Witney*.—Universal Aircraft Services, Ltd., co-operating: joy rides at 3s.

SURREY: *Brooklands*.—Brooklands Aviation, Ltd., and Brooklands Flying Club co-operating; Hawker Aircraft possibly arranging facilities. *Croydon*.—Provincial Airways, Ltd., reducing fares by 50 per cent. for first flights. *Reigate (Redhill)*.—British Air Transport, Ltd., will open aerodrome and give joy rides.

SUFFOLK: *Ipswich*.—Municipal Airport open, Eastern Counties Aero Club co-operating.

YORKSHIRE: *Leeds and Bradford (Yeadon)*.—Leeds-Bradford Municipal Aerodrome open free, Yorkshire Aero Club co-operating. *Brough*.—North Sea Aerial and General Transport, Ltd., opening aerodrome to public; flying by school machines. *Doncaster*.—Crilly Airways, Ltd., municipal airport, offering 10 per cent. reduction in fares.

WARWICKSHIRE: *Leamington*.—Leamington, Warwick and District Aero Club co-operating.

Scotland

INVERNESS. Joy rides at 2s. 6d. a head offered by Highland Airways, Ltd., Inverness, on D.H. "Dragon."

Last-moment Notifications.

As we go to press it is learned that, in addition to the above, the following aerodromes will also be open to the public:—Blackpool, Broxbourne, Bournemouth, Canterbury (Bekesbourne), Cambridge (Fen Ditton), Cardiff (Wenvoe), Cardiff (Pengham Moor), Cowes, Eastbourne, Gloucester (Churchdown), Gloucester (Hucclecote), Grimsby, Hull, Newcastle Gliding Club (Mootlaw), Newtownards, Northallerton, Northampton, Plymouth Rochford, Salisbury, Sandown, Shanklin, Shoreham, Southampton (Hamble), Southport, Stapleford, West Malling.

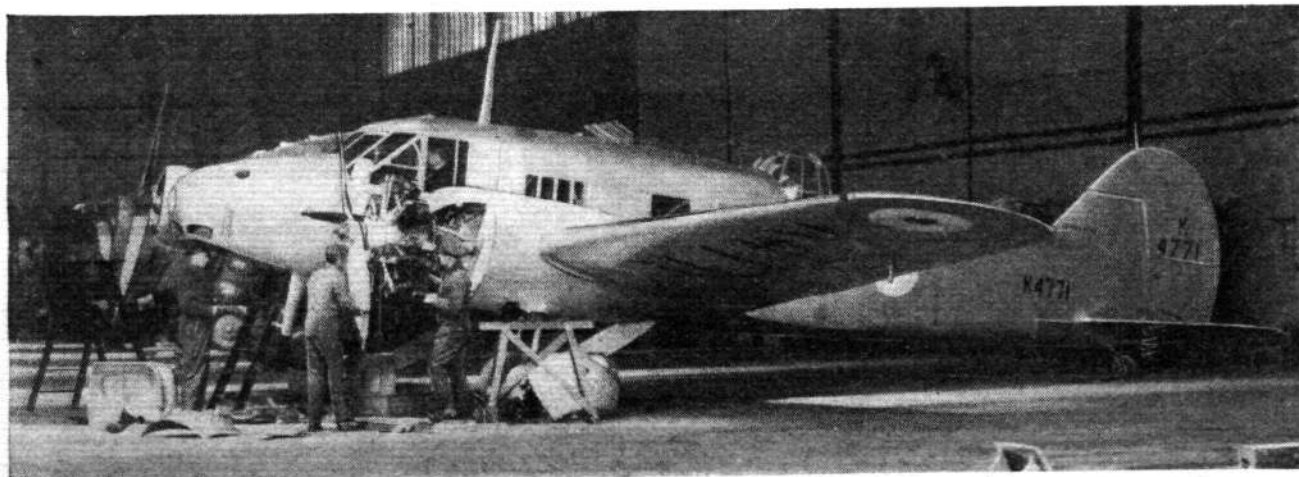
AIRCRAFT FACTORIES

DERBYSHIRE: *Derby*.—Rolls-Royce, Ltd., works will be open; here high powered aero engines, e.g., "Kestrel" and "Buzzard," are manufactured.

HERTFORDSHIRE: *Hatfield*.—De Havilland Aircraft Co., Ltd.: Organised tours conducted by students of De Havilland Aeronautical Technical School. The company will also open its factory on Friday, May 24. Applications for admission on this date should be sent to Publicity Dept., De Havilland Aircraft Co., Ltd., Hatfield, Herts. On Saturday factory will be open to all comers from 9 a.m. onwards, and it will be possible to see constructional work in progress.

MIDDLESEX: *Edgware*.—De Havilland Aircraft Co., Ltd.: Here the "Gipsy" aircraft engines and De Havilland controllable-pitch aircrews are manufactured; open on Saturday from 9 a.m. and on Friday to a limited number of visitors, whose applications should be sent to the Publicity Dept. at the company's Hatfield address.

ISLE OF WIGHT: *Cowes*.—Saunders-Roe, Ltd.: This company will afford every facility to visitors; in their works flying boats and amphibians are manufactured.



FOR COASTAL RECONNAISSANCE: The Avro 652 (two 270 h.p. Siddeley "Cheetah" engines) converted from a civil into a military type. Note the "birdcage" on top of the fuselage behind the wing.



COUPE DEUTSCH COMPETITORS : With Mademoiselle Deutsch de la Meurthe are the five Caudron pilots who competed in the race. From left to right they are : Arnoux (third), Delmotte (winner), Franco, Lacombe (second) and (in cockpit) Monville.

HERE AND THERE

Delmotte's Coupe Deutsch Victory

RAYMOND DELMOTTE, chief pilot of the Caudron Company, won the third annual Deutsch de la Meurthe Cup race, held at Etampes, about forty miles from Paris, last Sunday.

The winner's speed was the remarkable one of 443.96 km./hr. (277.5 m.p.h.)—a big increase in last year's winning speed of 241.7 m.p.h. He covered the 2,000 km. in 4 hr. 30 min. 17 sec. Delmotte was piloting a C.460 Caudron cantilever-wing monoplane, equipped with a 330 h.p. Renault six-cylinder-in-line inverted engine and a retractable undercarriage. He is reported to have covered one lap of the triangular course at a speed of over 290 m.p.h.

Yves Lacombe, also a Caudron pilot, flying a similar machine, took second place with an average of 424 km./hr. (265 m.p.h.). Another Caudron, similar to the other two, but with a fixed undercarriage, took third place at 348 km./hr. (217.5 m.p.h.), in the hands of last year's winner, Maurice Arnoux. The 100 km. record was broken several times in the course of the event.

A detailed account of the race will appear next week.

This Week's Supplement

Readers will, we think, agree as to the impressiveness of the large photographs of modern British aircraft to be found in the pictorial supplement accompanying this issue of *Flight*.

Newer readers who may not be adept at recognising air-

craft at sight will find the supplement useful as a guide to the types of machines which will be seen at the Empire Air Day displays next Saturday, at the Hendon R.A.F. Display on June 29, at the Royal Fly-past at Duxford on July 6, and at other aeronautical events during the season.

This collection of photographs will also form a souvenir of Jubilee year in British flying that will be well worth retaining for study in later years.

R.Ae.S. President and Vice-President

At the meeting of the Council of the Royal Aeronautical Society, held on Tuesday, May 14, the following elections were made for the year 1935-36:—

President: Lt. Col. J. T. C. Moore-Brabazon, M.C., M.I.Ae.E., F.R.Ae.S., M.P. *Vice-Presidents:* Mr. H. E. Wimperis, C.B.E., M.I.E.E., F.R.Ae.S.; Major T. M. Barlow, M.Sc., M.Inst.C.E., M.I.Mech.E., F.R.Ae.S.

G.E. Licence Examinations

The Air Ministry announces that examination boards will sit for the purpose of examining applicants for ground engineers' licences at the following places and times:—(a) London, weekly, on each Tuesday in July, August and September; (b) Croydon, on the second Friday in July, August and September; (c) Manchester, on the first Friday in September; (d) Bristol, on the first Friday in July; (e) Glasgow, on the first Thursday in August.

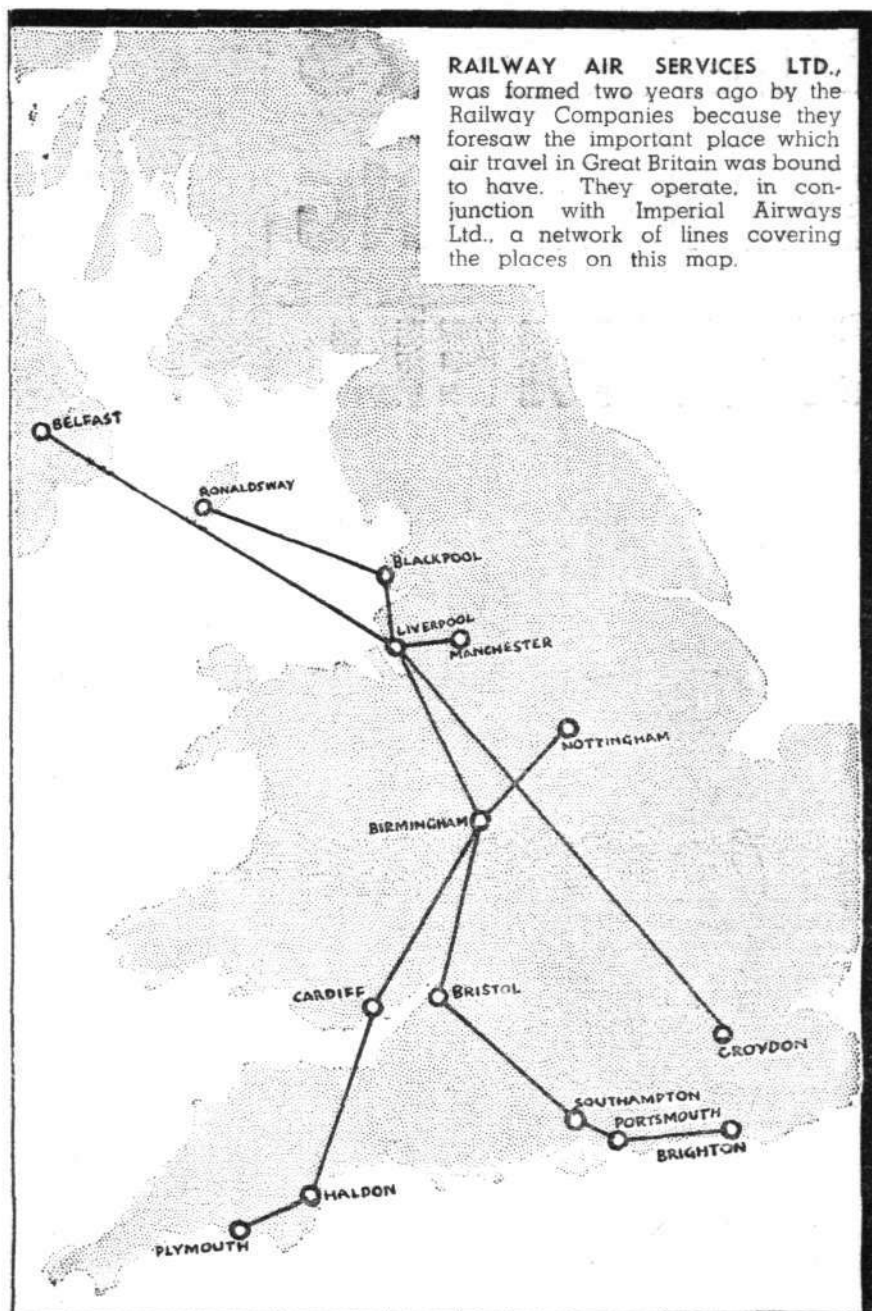
Applications for licences should be made on C.A. Form 2B.



AN AEROBATIC TRAINER : This new Focke-Wulf monoplane, the FW56, is intended for the training of pilots in aerobatics and fighting manœuvres. The engine is an Argus inverted vee eight of 240 h.p.

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which is obtainable on request, and should be addressed to the Secretary, Air Ministry (C.A.2), Adastral House, Kingsway, London, W.C.2. Applications for extensions to existing licences will also be dealt with at these boards, and such applications should be made on C.A. Form 2D. Applicants should indicate at which centre they wish to attend for examination.

Application for examination at the centres (c), (d) and (e) can only be accepted provided that the application, together with the appropriate fees, is received twenty-eight days before the dates specified.

Aero Golfing Society's Meeting

The summer meeting of the Aero Golfing Society will take place at the Wentworth Golf Club, Virginia Water, on Thursday, June 13, starting at 2 p.m. with the medal round for the *Flight* Challenge Trophy, and continuing in the evening with the four-ball foursomes for the Society Prizes. Full details are obtainable from the Hon. Secretary, Cdr. H. E. Perrin, 119, Piccadilly, London, W.1.

R.Ae.S. Awards

The R.Ae.S. announces that the Council has made the undermentioned awards for the year. The medals and prizes will be presented at the reading of the Wilbur Wright Memorial Lecture on Thursday, May 30, in the Aeronautical Section of the Science Museum, South Kensington, London, S.W.7.

The Society's Silver Medals.—Major F. B. Halford, F.R.Ae.S., for his work on aero engines; Mr. C. C. Walker, F.R.Ae.S., A.M.Inst.C.E., for his work in connection with the design of civil aircraft.

Simms Gold Medal.—Dr. L. Aitchison, B.Sc., F.I.C., for his paper on "Light Alloys for Aeronautical Purposes."

Taylor Gold Medal.—Mr. F. Rodwell Banks, O.B.E., F.R.Ae.S., A.M.I.Aut.E. for his paper on "Ethyl."

Busk Memorial Prize.—Mr. H. Roxbee Cox, Ph.D., D.I.C., B.Sc., A.F.R.Ae.S., for his paper on "The Stiffness of Aeroplane Wings."

The following will also be presented on the occasion of the Wilbur Wright Lecture:—

British Silver Medal for Aeronautics.—Messrs. W. A. Scott, A.F.C., and T. Campbell Black, for their achievement leading to advancement in the Science of Aeronautics Mildenhall-Melbourne, October 20-23, 1934.

Wright and Manly Medals (on behalf of the Society of Automotive Engineers, U.S.A.).—Mr. F. M. Thomas, A.F.R.Ae.S., for his paper read before the S.A.E. on "Engine Cowling and Cooling."

At Phoenix Park

The arrival competition for the National Aviation Day Display on May 12 brought several aircraft across the Channel, including two "Leopard Moths," a Miles "Hawk Major," and two Caudron "Freygate" monoplanes from France, flown by reserve officers of the French Air Force. Miss Ruth Hallinan, of the Cork Aero Club, flying a "Moth," won the competition, Flt. Lt. "Tommy" Rose (Miles "Hawk Major") was second, and Mr. C. F. French, Irish Aero Club ("Moth") was third.

A visitor from Northern Ireland, Mr. Collins, of the Ulster Gliding Club, put up a very good show of aerobatics on a glider, and Miss Joan Meakin also gave a gliding display. The *pièce de résistance*—in other words the "set piece"—was the Free State Army Air Corps attack on a magazine, which very disobligingly went up in flames at the wrong moment. The Ministers for Defence, Industry and Commerce and Finance were present at the display.

The Royal Fly-Past

It is understood that a total of 320 aircraft, in thirty-five squadrons, will fly past Their Majesties the King and Queen at the Royal Air Force Jubilee Review at Duxford Aerodrome, Cambridgeshire, on Saturday, July 6.

The King, who, as Chief of the Royal Air Force, will probably wear its uniform, is to make a preliminary inspection of the machines in their concentration park at Mildenhall. He will arrive here at 11.30 a.m., and the inspection will take about three-quarters of an hour. He will then motor along the main road to Duxford via Newmarket, the twenty-five-mile route being closed to traffic.

Their Majesties will lunch in the Mess at Duxford, and at 2.15 will take up their position on the Royal dais, which will be in the centre of the aerodrome. Simultaneously the first machines of the formations will arrive, and as each squadron crosses the aerodrome it will dip in salute. The fly-past is expected to take a full half-hour.

Fifteen thousand guests will attend Duxford, but the general public will not be admitted. Surrounding the aerodrome, however, there are country roads which will provide good vantage-points, and the presence of thousands of spectators is anticipated. The police are expecting to be faced with a difficult traffic problem, and the Automobile Association and National Car Parks, Ltd., are organising large parking-places, one occupying 150 acres of farm-land alongside Duxford Aerodrome.

A New Merger?

As we go to press persistent rumours have it that negotiations are on foot between General Aircraft, Ltd., of Hanworth, and Westland Aircraft, of Yeovil, the assumption being that G.A.L. may purchase from Petters, Ltd., the Westland Aircraft Works (which have, of course, been a branch of Petters, Ltd., from the start) and form the amalgamation into a new company. The fact that Sq. Ldr. T. H. England has severed his connection with Handley Page, Ltd., would appear to be not unconnected with the rumour, he being a brother of Mr. E. C. Gordon England, who is a director of General Aircraft.

British Instruments at Brussels Show

On May 14 the formal opening of the aviation section of the Brussels International Exhibition took place.

The Belgian Minister of Transport, M. Spaak, together with General Chabot and several other high officials from military and civil aeronautical circles, attended the ceremony.

All the stands were closely inspected, and the Minister was greatly interested in the aircraft instruments exhibited by Messrs. S. Smith and Sons, of Cricklewood, who, by the way, were the only firm to exhibit aviation instruments at the exhibition.

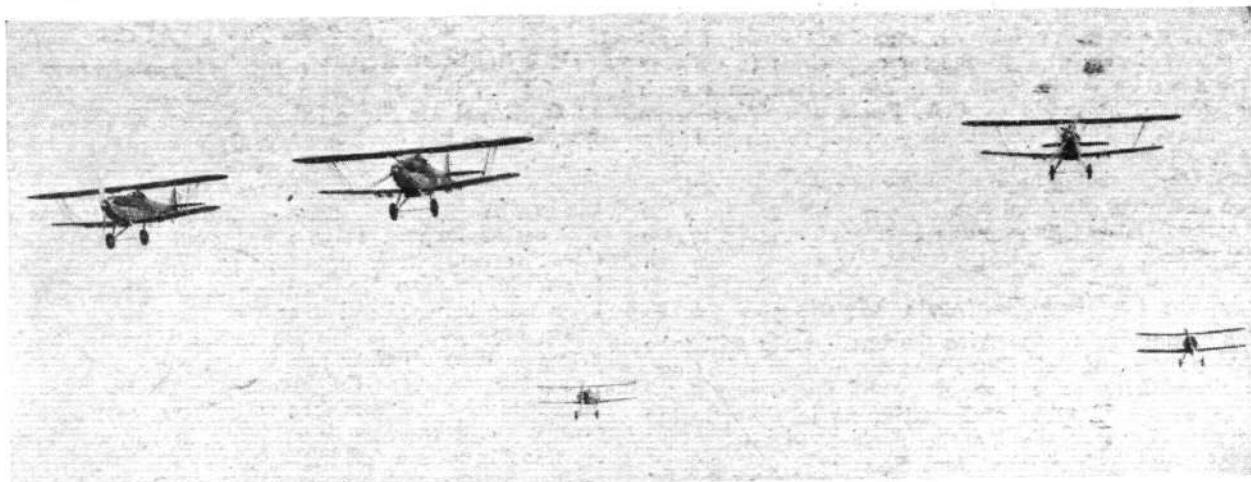
M. Eichberger, the company's Belgian agent, gave a detailed description of every instrument on show, and when leaving the Minister congratulated Mr. J. E. Chorlton on the display.

Coupe Deutsch Equipment

In the Coupe Deutsch contest, the result of which is reported on the previous page, the machines of the winner and runner-up were equipped with Palmer tyres.



A MILITARY de HAVILLAND: The D.H. 89 (two 200 h.p. "Gipsy Six" engines) Coastal Reconnaissance machine. It has a fixed machine gun on the starboard side of the nose, and bombs are carried inside the fuselage. Note the shield for the rear gunner.



“GAUNTLETS” V. “HARTS”

Jubilee Affiliation at Turnhouse

By MAJOR F. A. de V. ROBERTSON, V.D.

THE “Gauntlets” have done their first serious job of work in the Royal Air Force. No. 19 (Fighter) Squadron from Duxford is the first unit to receive this new and very excellent fighter aeroplane. By the beginning of May the re-equipment of the squadron was almost complete, and in the week preceding the Jubilee it sent up “C” Flight to affiliate with No. 603 (City of Edinburgh) (Bomber) Squadron at Turnhouse.

Affiliation is a term which does not altogether explain itself. It means that a fighter squadron visits a squadron of a different category and lives with it for a week or more, and the two practise together some form of attack and the appropriate answer to it. The Command, Air Defence of Great Britain, lays down what form of attack shall be practised, and the bombers or flying boats, as the case may be, try to work out the best reply to that attack. The bombers, of course, do not try to evade the fighters; they want the interception to take place. Then the camera guns get busy, and when the films are developed the effectiveness of each attack and of the defence can be judged. Frequent conferences are held, and the happenings of each attack are discussed by both sides. A report on the results is sent up to A.D.G.B. Headquarters, and by the end of the season the Staff has before it the results of quite a number of affiliations and the opinions of the Commanding Officers who have taken part in them, the whole forming a mass of data for formulating future tactics.

There are various forms of possible attack. For instance,

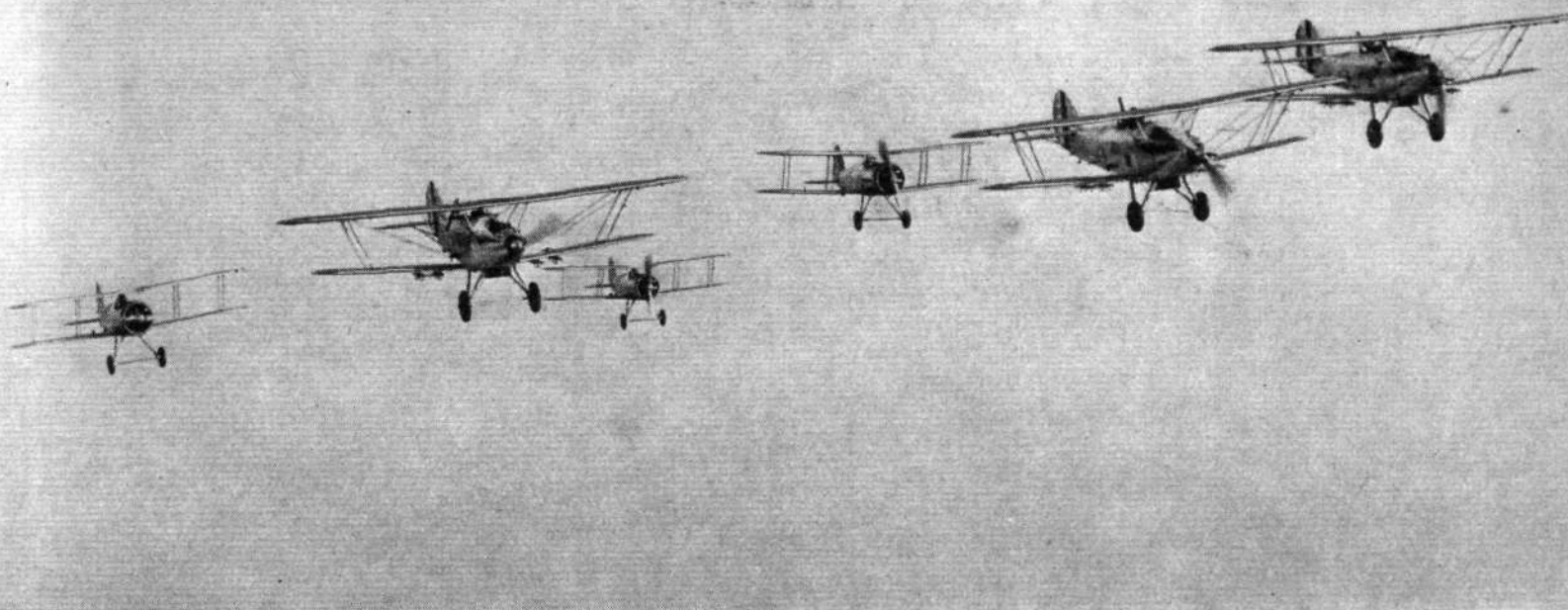
there is the attack by a formation on a formation of equal size, and there is the attack by a flight on a single bomber or by one fighter on one bomber. There is attack when the bombers are flying just above the clouds, and a different attack when they are flying just below the clouds. Attacks on two-seaters must necessarily be different from attacks on single-seaters; and there are any number of other possibilities. What Major Mannock, V.C., and Major McCudden, V.C., had to work out for themselves in the stress of war is now explored and practised with care and

forethought in time of peace. If war should ever come again Britain does not propose to send raw pilots who can just fly to learn how to fight by actual fighting. Pilots now, so to speak, are coached at the nets before they are allowed to bat in a Test Match where a second mistake is not a possibility. Affiliations, therefore, are a very important part of the annual training of R.A.F. squadrons.

When an aeroplane of a new type takes part in its first affiliation the occasion is charged with interest. The Gloster “Gauntlet,” with Bristol 640 h.p. “Mercury VI S,” is a machine which prompts the use of superlatives. It is most refreshing to hear the pilots who have flown it wax eloquent in its praise. It has a top speed of 230 m.p.h., and can be landed at a bit over 60. It can climb to 15,000 feet in 6.35 minutes, and its service ceiling is 34,000 feet. All that is good, very good, but it is not the whole story. The pilots say that it is the nicest machine to fly ever. You don't really need



Sqn. Ldr. Lord George N. Douglas-Hamilton, Commanding Officer of No. 603 (City of Edinburgh) (Bomber) Squadron (left) conferring with Flight Lieut. Victor Croome of No. 19 (Fighter) Squadron. (Flight photograph.)



The two photographs on this page illustrate the attack of a flight of "Gauntlets" on a flight of "Harts." In the above picture one fighter is seen on the left, coming up behind and below the starboard bomber, while two "Gauntlets," one behind the other, are stalking the port bomber which appears on the right of the picture. In the lower picture is shown the view of the gunner in the port "Hart" as the two fighters approach him. He dare not fire at them for fear of hitting his own fin, but must trust to cross fire from the "Hart" on his starboard side. (*Flight* photographs.)

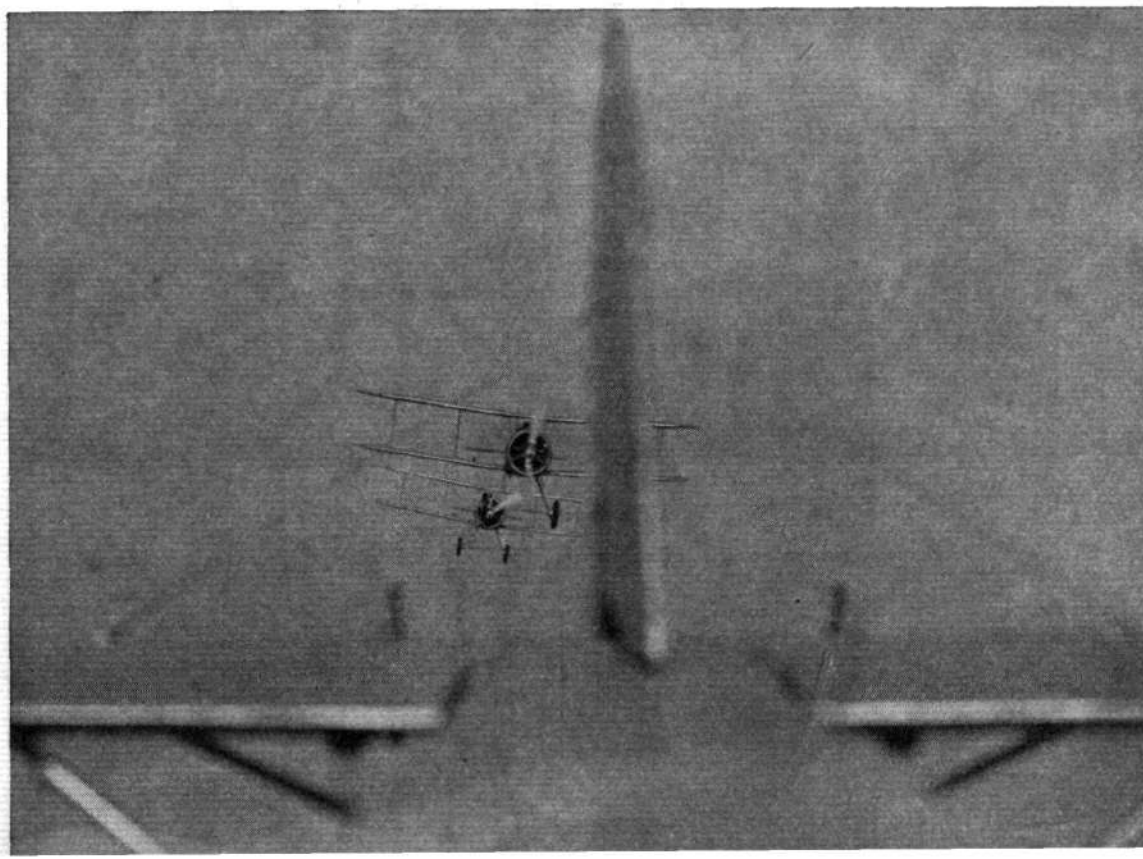
to use the controls, they say; you just think of what you want to do, and the "Gauntlet" reads your thoughts and does it; the sensation is just like having wings on your own body. And it has absolutely no vices. They seriously doubt if they could stall the machine, but if they succeeded it would just put its nose down and dive straight. In fact, no praises could be too high for it, and Mr. Folland is the greatest man that ever lived. Thus the pilots.

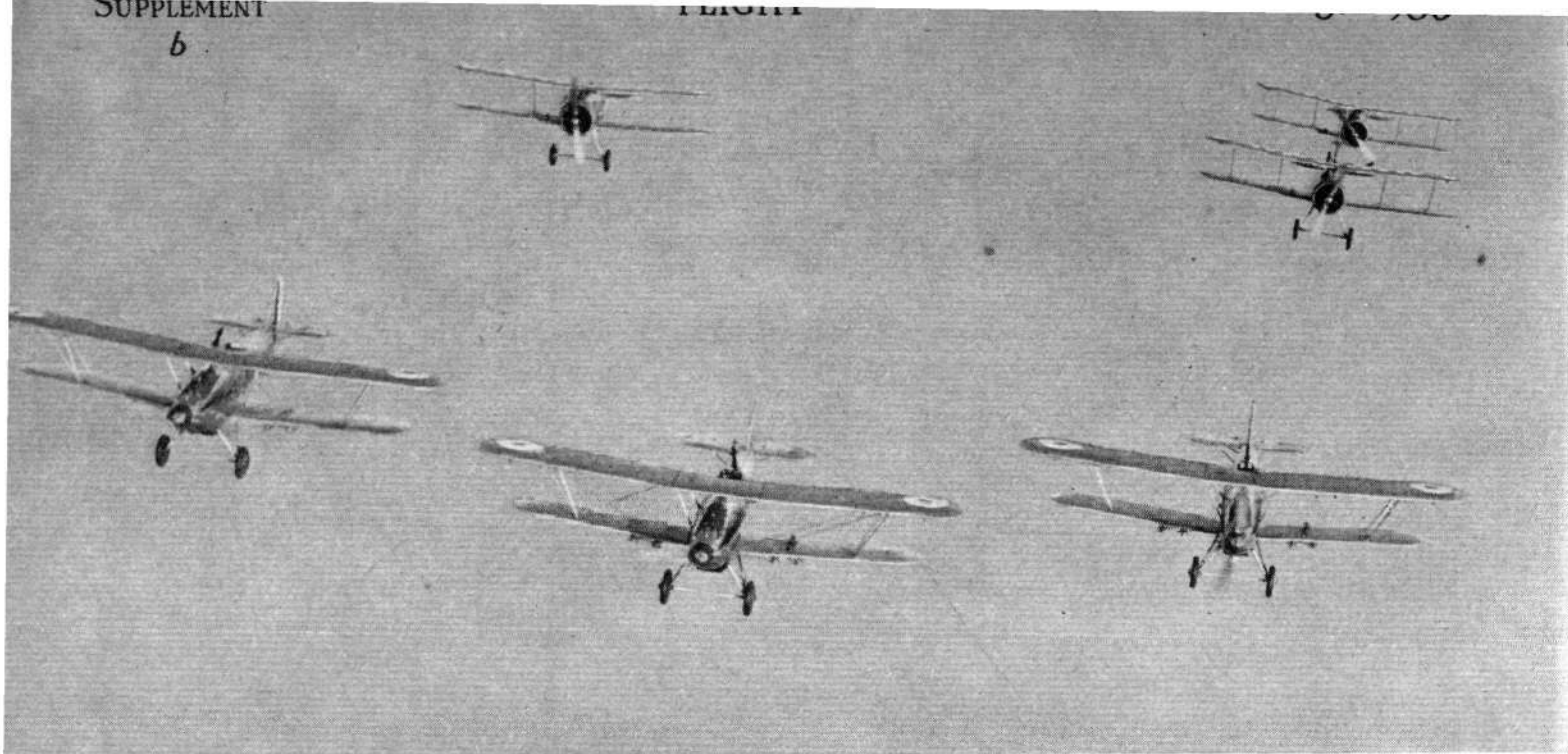
Of course, they have taken off the "spats." You may trust a squadron to take off spats at the earliest opportunity. They also sometimes take out the oil and petrol tanks, for duralumin tanks sometimes come unstuck; and if you want to see some really snappy repair work done, just watch the riggers of No. 19 (Fighter) Squadron whip out an oil tank and fit in a new one. It is all over before you could say "Jack Robinson," and up goes the "Gauntlet" again to some invisible spot in the stainless blue.

The blue is not always stainless at Turnhouse, as *Flight* representatives have sometimes found to their cost. "Auld Reekie" sometimes sends out a blackish pall, and at other times a haar comes up from the sea and blots out the Forth and the banks on both sides. This affiliation of No. 19 F.S. and No. 603 B.S. lasted nine days, and attacks were practised on six of them. The visit ended up in the blaze of glorious weather which accompanied the Jubilee, and both squadrons made the most of it. The new C.O. of No. 603 B.S. (Sqn. Ldr. Lord George Douglas-Hamilton) is a glutton for work, and the aircraft spent much more time in the air than they did on the ground. Energies were redoubled at the week-ends when the Auxiliary Air Force officers could turn out in full strength and could give their whole time to the business. On the last Saturday one of them, after finishing his Saturday morning's work, motored a hundred miles up from Castle Douglas in Galloway, and appeared on the aerodrome munching his sand-

wich lunch. Presumably he changed into uniform as he drove. Up went the flights for an hour or more, came down, had some tea and perhaps changed a tank, and then up again. One pilot at tea-time helped himself to a slice of cake and addressed it movingly. "You poor little blighter," he mused, "you are going straight up to 17,000 and you know nothing about it."

On the ground the warfare was continued wordily. The fighter pilots were positive that once they had intercepted the bombers they could eat them up from the tail. The bomber pilots and gunners were equally sure that they could beat off the attacks, keep their formation, and hold their course. Stories were told of great fights in the past; one of a single duel between a "Wapiti," with a very fine A.A.F. gunner in the back seat, against a "Fury." Every time the "Fury" came in to the attack the "Wapiti" pilot dropped his tail and the gunner loosed off. When the films were developed the fighter had not scored a single hit and the "Wapiti" gunner had scored 80 per cent. But things are different when the bombers must keep formation, and when the blind spot under each tail must be guarded by the fire of a gunner in another





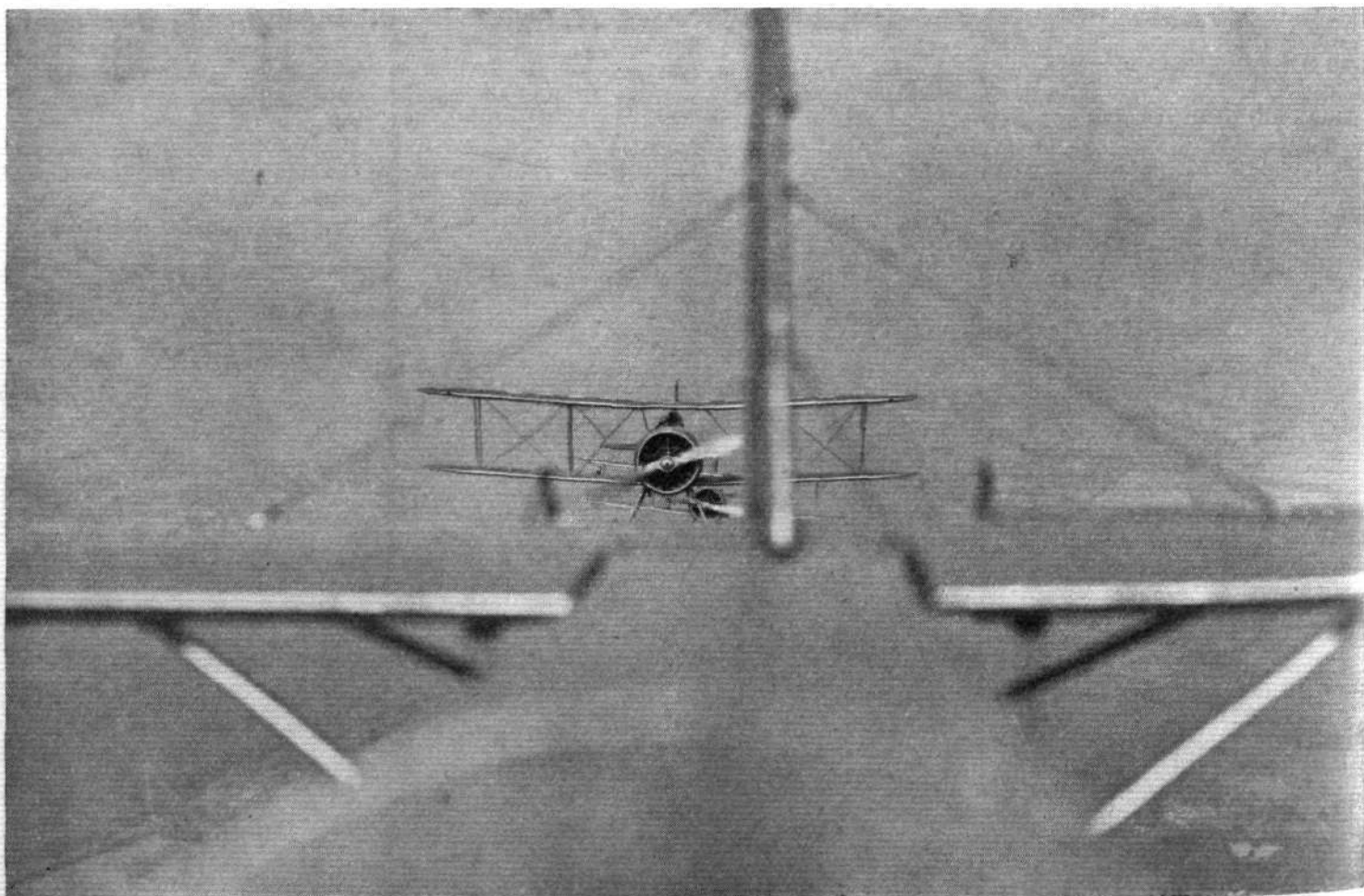
Another view of the attack by the "Gauntlets," which shows still more clearly one fighter tackling the starboard bomber while two approach the port bomber. If their attacks are successful the leading "Hart" will be left alone to deal with all three fighters. The lower picture gives another view from the gunner's cockpit in the port "Hart." Note how the fighter pilots are shielded by their "Mercury" engines. (*Flight* photographs.)

bomber. "A man never shoots so straight," chuckled the fighter pilots, "when he is defending his pal as when he is defending himself." Naturally, it would be rather disappointing to shoot down the fighter which was attacking your friend and immediately after to get a pattern of bullets through the soles of your feet from the other fighter which your friend had failed to shoot down.

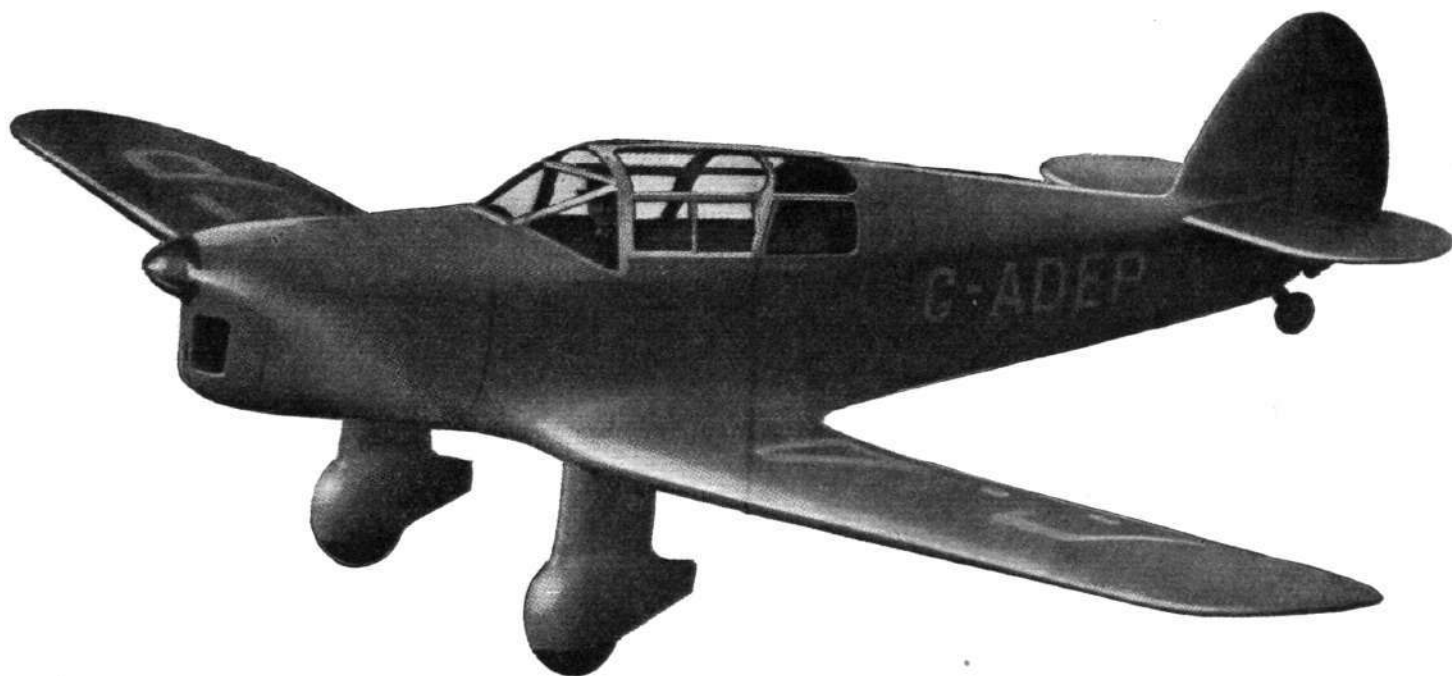
Methods of attack by fighters may be studied periodically at the Hendon Display, but they are varied from time to time. The photographs which accompany this article tell a story. In them the reader may see the "Gauntlets" stalking up behind the flight of "Harts," hoping perhaps for a surprise, seeking the blind spot under the tail of the bomber, and sheltering themselves so far as possible

behind the bomber's fin and rudder. In this case they have not come out of the sun (there would have been no photograph if they had) and the air gunners have spotted them. The bomber pilots drop their tails to give the gunners clear shots at the fighters, but the pilots of the latter are well protected by the mass of metal "Mercury" in front of them, and present but a tiny target. The bombers have two preoccupations, to fight and to hold their course; the fighter has only one, namely, to fight. If the bombers are driven well off their course, the fighters have scored a point, even though they may not cause any one of their opponents to qualify for the Caterpillar Club.

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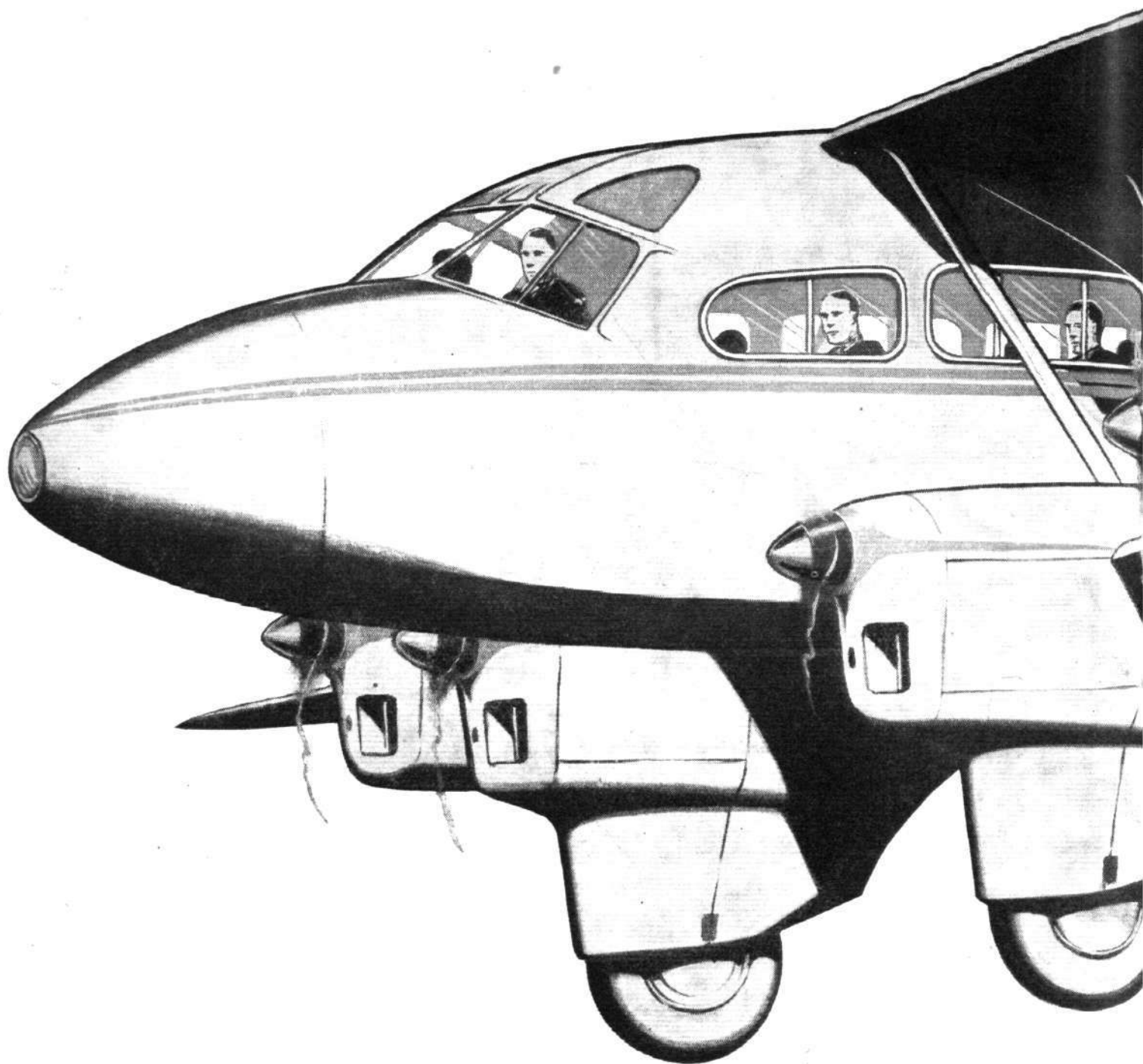
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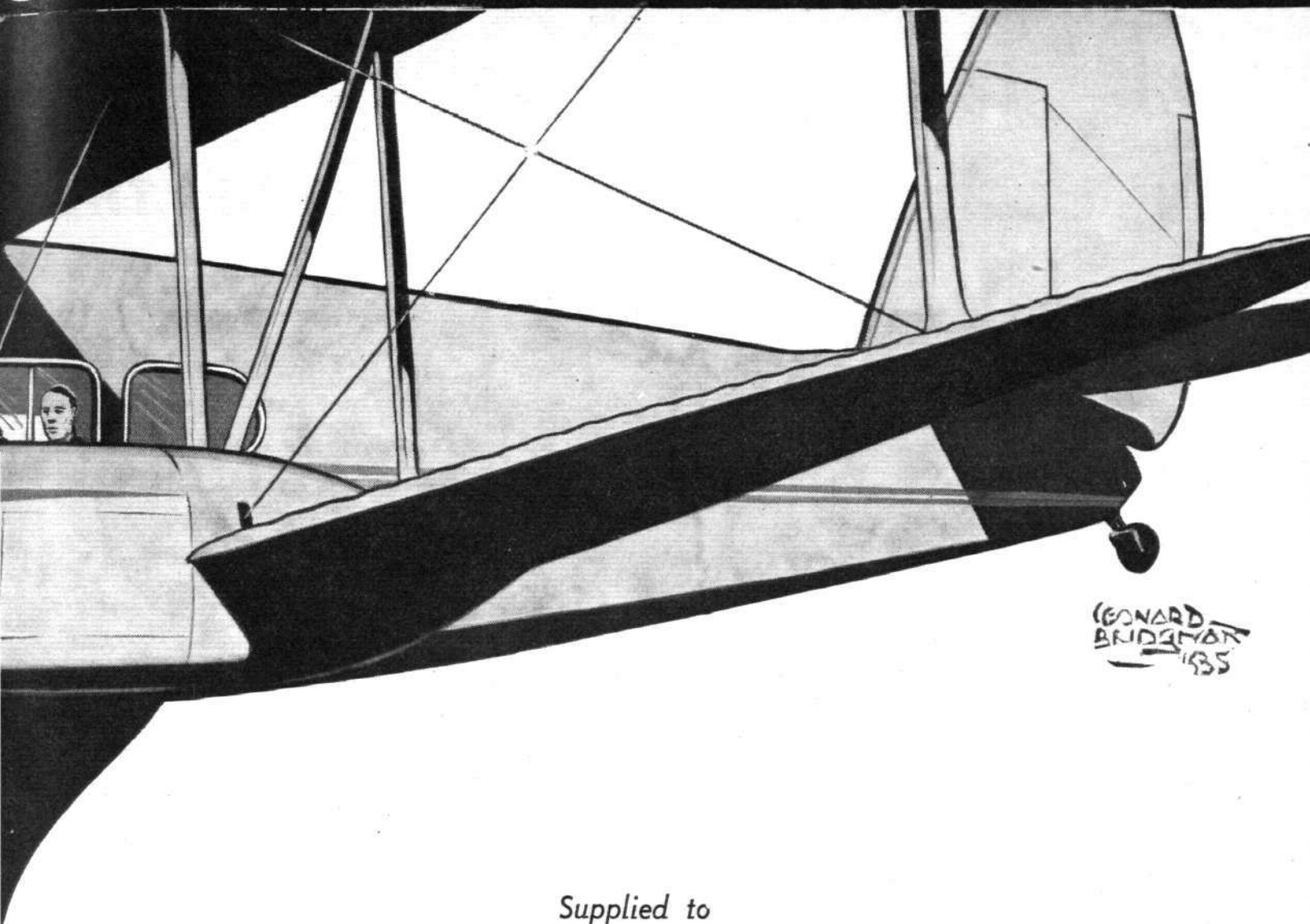
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ENGINE - - - one engine stopped—13,500 ft. (4,120 metres).

two " " — 4,500 ft. (1,370 ").

both engines on

CE - - - one side stopped—2,500 ft. (765 ").

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Siddeley Engines standard
Dunlop Tyres and Wheels
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Photo by courtesy of "The Daily Mail"

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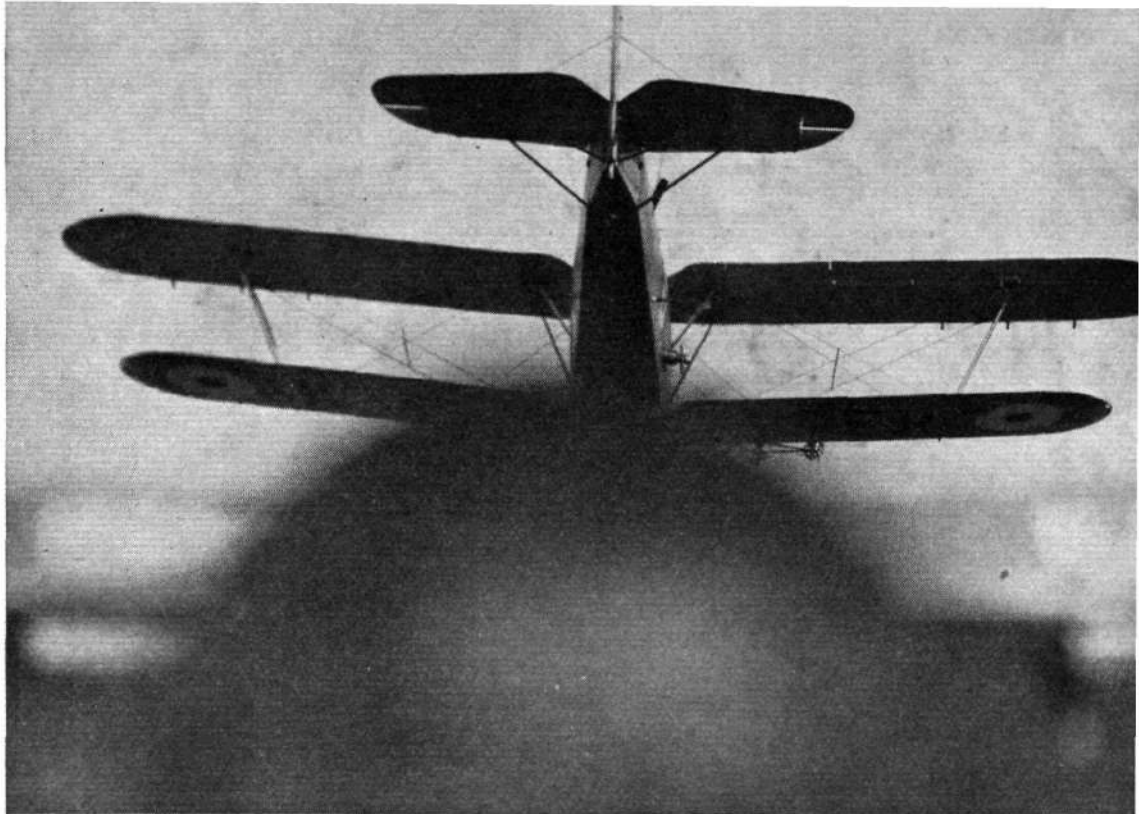
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aerodromes to visit than Turnhouse. Though the approaches are open, there are hills in the distance to break the monotony of view which characterises so many aerodromes; and if one just goes up a little bit on a fine day, there beneath one lies the Firth of Forth, the Forth Bridge, and all the exquisite setting of the City of Edinburgh. Above all, the visitor is impressed by the enthusiasm which fills everyone in the City of Edinburgh Squadron. The officer who motored a hundred miles to be in time for Saturday afternoon's flying is typical of them all. Most of the A.A.F. officers are old friends of *Flight*, though some old faces have now gone. Of course, the late Squadron Leader Murray Philipson is very badly missed. Obviously a great inspiration to his squadron, to *Flight* he appeared as the soul of warm hospitality and friendliness. Others have finished their time with the squadron, but new officers come to take the places of those who have left. Five new officers are now undergoing flying training on "Lynx" Avros.

In Auxiliary airmen the squadron is now up to establishment, and the technical quality is of a very high standard. The A.A.F. fitters and riggers have reached a stage when they can keep the engines and aeroplanes in flying condition without any help from the permanent staff of regulars. The town headquarters play no small part in keeping up the keen squadron spirit of the airmen. Throughout the winter they have ground instruction there on Mondays and Thursdays every week, and drill on Fridays for recruits. Dances are held, badminton is played, and there is a miniature rifle range. This year No. 603 B.S. won the miniature rifle cup for Territorial and A.A.F. units in Edinburgh. So keen is the competition to enlist in the squadron that recruiting is now practically limited to the months of October and November, and as the choice is so large the recruits chosen are all very good. Only occasional, and probably exceptionally good, men are enrolled at other times of the year.

Since the last time that *Flight* visited Turnhouse the



This remarkable photograph shows the attack from the fighter's point of view. The head of the fighter pilot is naturally out of focus. He has now got into position in the blind spot below the "Hart" and is about to riddle it with bullets from his two Vickers guns. (*Flight* photograph.)

squadron has exchanged its "Wapitis" for "Harts," and, owing to the frequent thick weather near the Forth, the turn indicator on the latter type of machine is an acquisition which is much appreciated. New red-brick buildings have also arisen on the aerodrome, which look very much like a barracks, institute, officers' mess, and squash court. It is said that they are on the Secret List, but they stand close to the main Edinburgh-Stirling road, and they are not enveloped in a veil of invisibility, so guesses at their character can hardly be a crime under the Official Secrets Act. The squadron has also acquired a bombing range of its own at Levenseat—near West Calder, some twenty miles away from Turnhouse—which is manned and worked for love by members of the local Territorial Royal Engineers. The squadron merely provides the T.A. men with rations, and this voluntary work of theirs shows a fine sporting spirit. The ground is moorland, and is actually owned by an officer of the squadron.

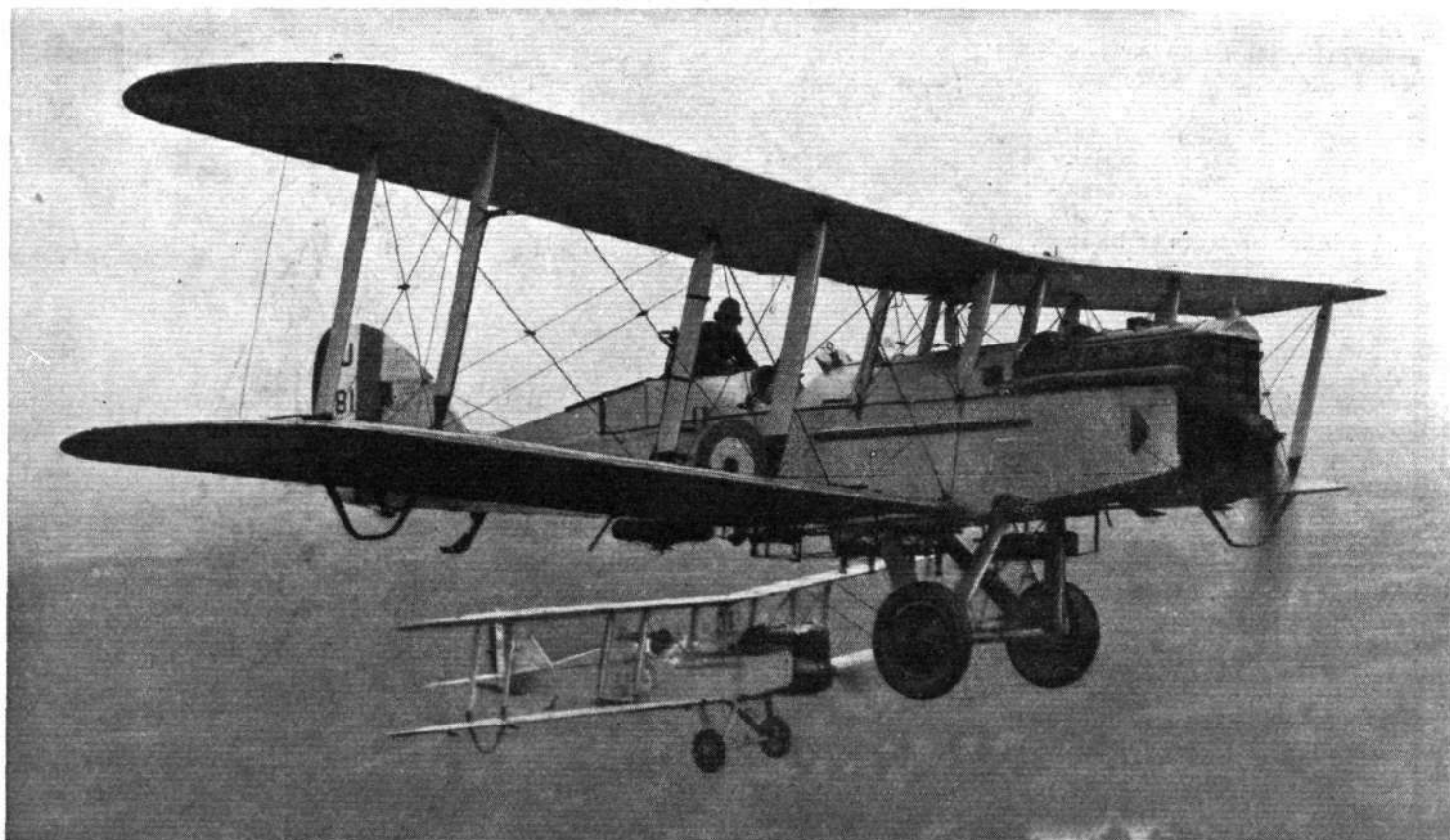
The City of Edinburgh Bomber Squadron has not yet won the Esher Cup, but it has designs upon it. Cup or no cup, the squadron is a keen and hard-working unit, of high efficiency, and full of the right spirit.



The gunner in a "Hart," disregarding a fighter which is under his own tail, is aiming his gun at a "Gauntlet" which is attacking the "Hart" on his left. The bomber formation relies almost entirely upon cross-fire. (*Flight* photograph.)

THE GROWTH of SERVICE FLYING

Early Days of British Military Aeronautics : The War Period

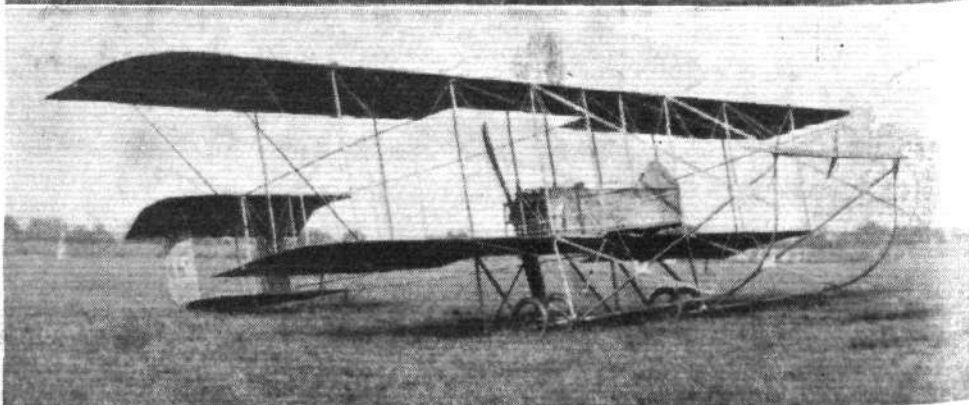


The D.H.9A (400 h.p. Liberty engine), which was introduced in 1918 and remained in extensive use until a few years ago, may be regarded as one of the typical intermediate types between the early and the modern military aeroplanes. (*Flight* photograph.)

THE first attempts of a British fighting Service to use aircraft as a means of reconnaissance were made in 1878. In that year Capt. (afterwards Col.) J. L. B. Templer, of the 2nd Middlesex Militia, who was an experienced aeronaut, was permitted to instruct several officers of the Royal Engineers in the art of ballooning, and at the same time a Balloon Committee was formed at Woolwich Arsenal. This presently developed into the Balloon Equipment Store. In 1883 Templer introduced the use of goldbeaters' skin for the making of envelopes, and engaged the services of a family named Weinling, who knew the secret of piecing the skins together. This family kept the secret very close, and the construction of one balloon was delayed because one of the Weinling men was sentenced to three months' imprisonment for assaulting the police. Templer then, with great difficulty, persuaded the mother of the family to teach the secret to two sappers.

In 1884 a complete balloon detachment took part in the Bechuanaland expedition, and, while it was still in

South Africa, another detachment from the Balloon Equipment Store (then located at Chatham) was sent out with the expedition to Suakin. In 1887 Army aircraft were put on an official footing for the first time, when Major Templer



Early military flying depended largely upon these two Farman types, the Henry above, the Maurice "Longhorn" below. The former had an 80 h.p. Gnome and the latter a 60 h.p. Renault engine. (*Flight* photographs.)



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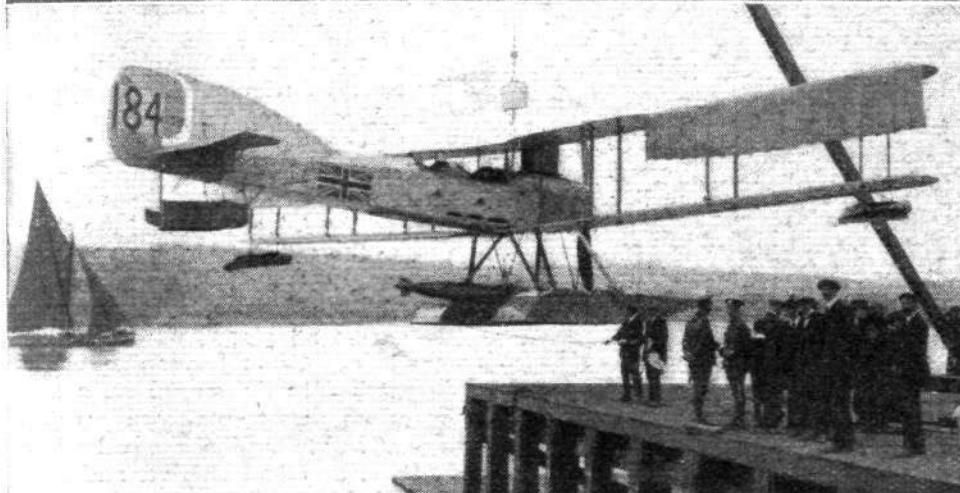
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The Vickers "Gun Bus" shown in the upper picture did much good work during the early part of the war. It was fitted with a Gnome rotary engine. The Short "225" (Sunbeam engine) was our first torpedo-plane and was used extensively by the Royal Naval Air Service. (*Flight* photographs.)



The British Army watched the new development, but hesitated (wisely, as it has since been proved) to plunge into the new form of aeronautics. In 1906 Lieut. J. W. Dunne, of the Wiltshire Regt., was attached to South Farnborough to experiment with his automatically stable aeroplane, while in 1907-8 full Army assistance was given to Mr. Cody in building his imposing, but not very useful, "cathedral." At that time the Santos-Dumont airships seemed more promising, and Col. Templer went to Paris in 1902 to inspect them. In 1907 Farnborough produced the *Nulli Secundus* airship. Considering how undeveloped both aeroplanes and airships were at that time, more could hardly have been expected of the Army authorities.

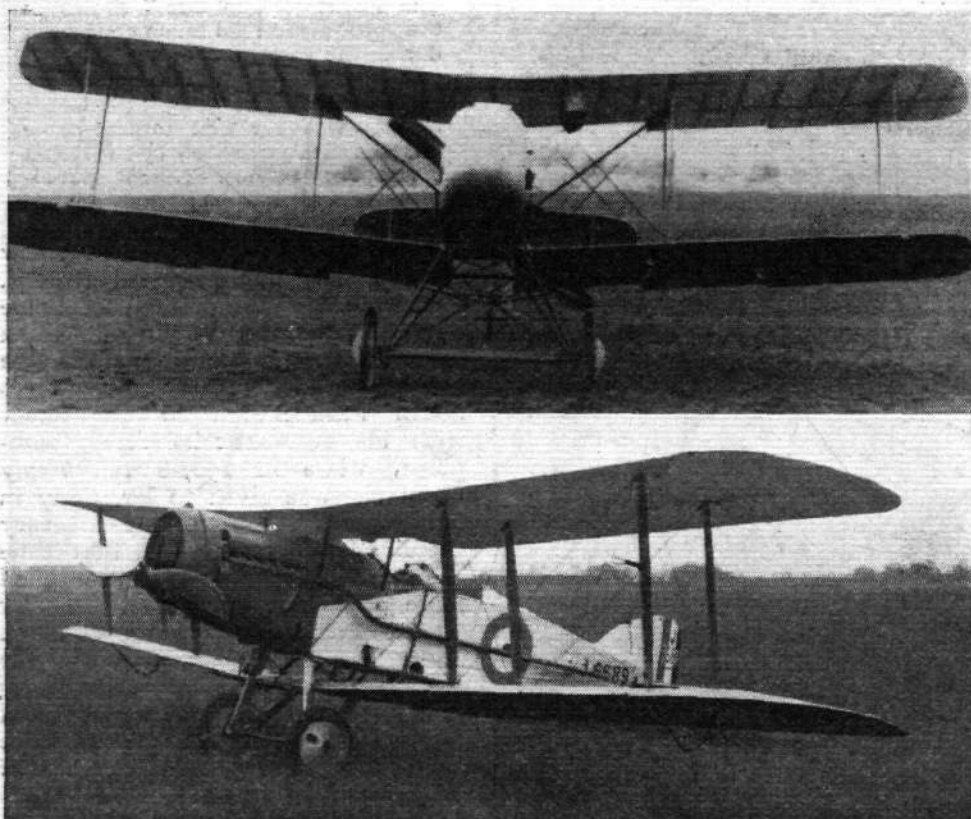
was gazetted Instructor of Ballooning, and his pay of £600 p.a. was provided in Army Estimates. Two years later Sir Evelyn Wood was so much impressed by the observation work of the balloons on manoeuvres at Aldershot that he recommended the transference of the Balloon Establishment from Chatham to Aldershot. This was carried out in time, and so was founded the present famous Royal Aircraft Establishment at South Farnborough. In 1894 a move was made towards heavier-than-air craft, when man-lifting kites were added to the equipment. Before that time (actually in 1890) the unit had become the Balloon Section of the Royal Engineers, with a strength of three officers, three sergeants, and twenty-eight rank and file.

A balloon detachment was sent out to the South African War in 1899, and did some good observation work at the battles of Magersfontein and Paadberg. Difficulties were discovered, however, which ought to have been found out and corrected on manoeuvres at home. No reliable means of communication between the basket and the ground had been devised, and the gas cylinders used were difficult to transport in a war of movement. The South African War ended in 1902, and next year the Wright brothers made the first aeroplane flights in America. The French pioneers were also successful, and in 1908 Alliott Verdon Roe was hopping about in his triplane.

Both these machines were designed by the Royal Aircraft Establishment. The F.E.2B was a pusher with 120 h.p. Beardmore engine, and the B.E.2C was an automatically stable tractor biplane with 90 h.p. R.A.F. engine. (*Flight* photographs.)



Progress, however, was made by private experimenters, and by 1910 matters had so far advanced that the Army decided to include aeroplanes in its equipment. An Army Order dated February 28, 1911, announced the formation of an Air Battalion of the Royal Engineers. The commanding officer was Sir Alexander Bannerman, a balloon expert, and there were two companies in the battalion. No. 1 Co. was commanded by Capt. E. M. Maitland, of the Essex Regiment, and dealt with airships. It was stationed at South Farnborough. No. 2 Co. was commanded by Capt. J. D. B.



Carrying a gun in the nose of its nacelle, the D.H.2 (upper picture) pusher (100 h.p. Gnome Monosoupape) was very effective against the Fokkers. The Bristol Fighter (250 h.p. Rolls-Royce "Falcon") was built in huge numbers during the war and did excellent work. (Flight photographs.)

Fulton, R.F.A., and was stationed at Larkhill on Salisbury Plain. It dealt with aeroplanes. Capt. (now Air Chief Marshal Sir) H. R. M. Brooke-Popham, of the Oxfordshire and Buckinghamshire Light Infantry, joined the battalion early in 1912. At this point it may be mentioned that in 1911 the Admiralty ordered the building of a wooden rigid airship, known as the *Mayfly*, which never flew, as its back was broken by a storm while it was moored out on the water. In the same year four naval officers were officially taught to fly at Eastchurch aerodrome.

A great forward step was taken on April 13, 1912, when the King signed a Royal Warrant which brought into being the Royal Flying Corps, with Naval and Military Wings. The Naval Wing was shortly and unofficially transformed into the Royal Naval Air Service. The R.F.C. remained a Corps of the Army until April 1, 1918. The Central Flying School was instituted at Upavon under the command of Captain (afterwards Admiral Sir) Godfrey Paine, with Major (now Lord) Trenchard of the Royal Scots Fusiliers as Second-in-Command. Officers who applied for attachment to the R.F.C. first had to learn to fly at their own expense, and then were sent to the C.F.S. for a military course to qualify for their "wings." It may be noted that no officers were actually posted to the R.F.C.; all belonged either to the Royal Navy (in the early days) or to their regiments.

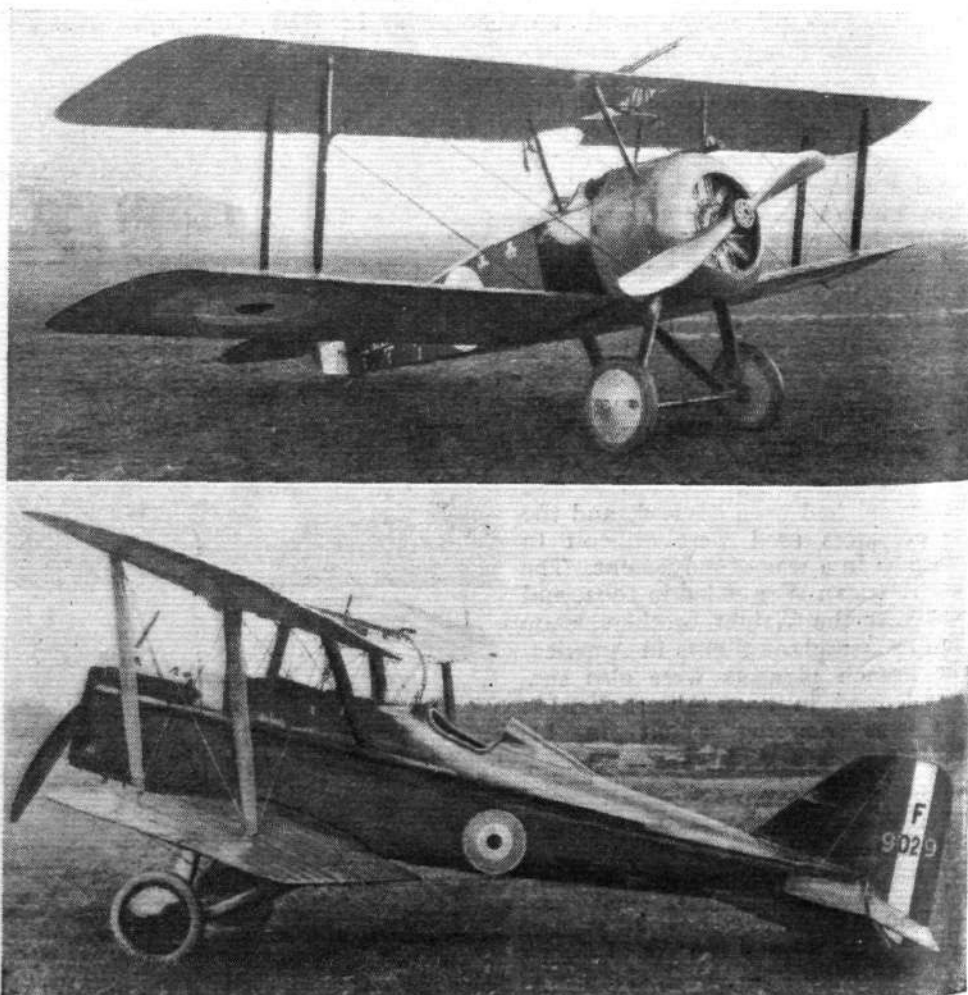
In the Army manoeuvres of 1912 both aeroplanes and airships took

Two single-seater fighters which beat the "Albatros" and Fokker Triplane were the Sopwith "Camel" (upper picture) with 150 h.p. B.R.1 rotary engine and the S.E.5A with 240 h.p. Wolseley "Viper." (Flight photographs.)

part. The airship *Gamma* was equipped with wireless and so was of more use to the Army staff than were the aeroplanes, but at the end of the manoeuvres General Grierson, one of the ablest British commanders of the day, wrote of the aircraft: "The impression left on my mind is that their use has revolutionised the art of war."

In August, 1914, the young R.F.C. went to war, as did the equally young R.N.A.S. Capt. Maitland and his airship company had been handed over to the Admiralty, and the R.F.C. was in the act of forming a new No. 1 Squadron. Only four squadrons were in existence, Nos. 2, 3, 4, and 5, and they were all placed under the command of General Henderson and despatched to France. Nos. 2 and 4 Squadrons were equipped with the B.E.2C. type, and No. 4 had a Wireless Flight attached to it. No. 3 had Blériots and Henry Farmans, and No. 5 had Henry Farmans, Avros and B.E.8's. The only function of the R.F.C. at first was reconnaissance for the Staff. Artillery co-operation, bombing, fighting, and photography were later developments. Still later came the idea that whole squadrons should be devoted to special kinds of work.

In the summer of 1915 the Fokker monoplane appeared



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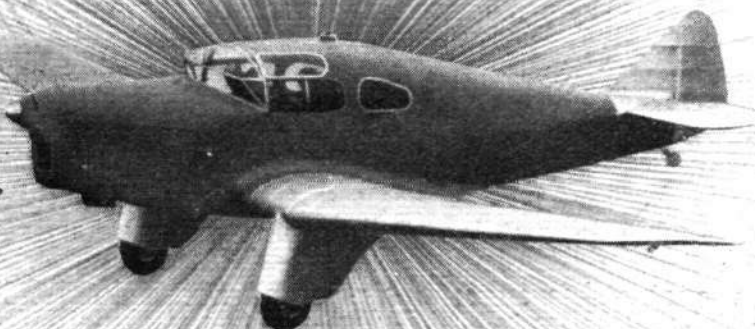


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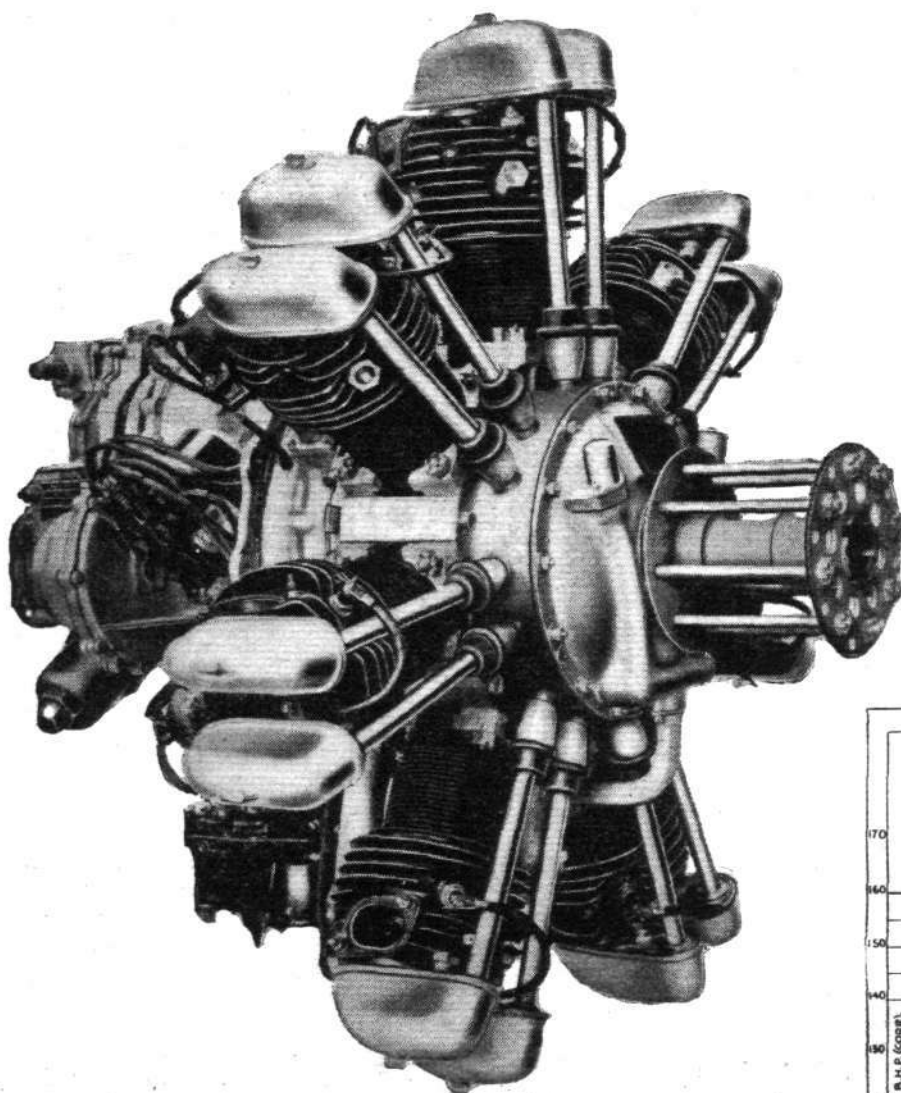
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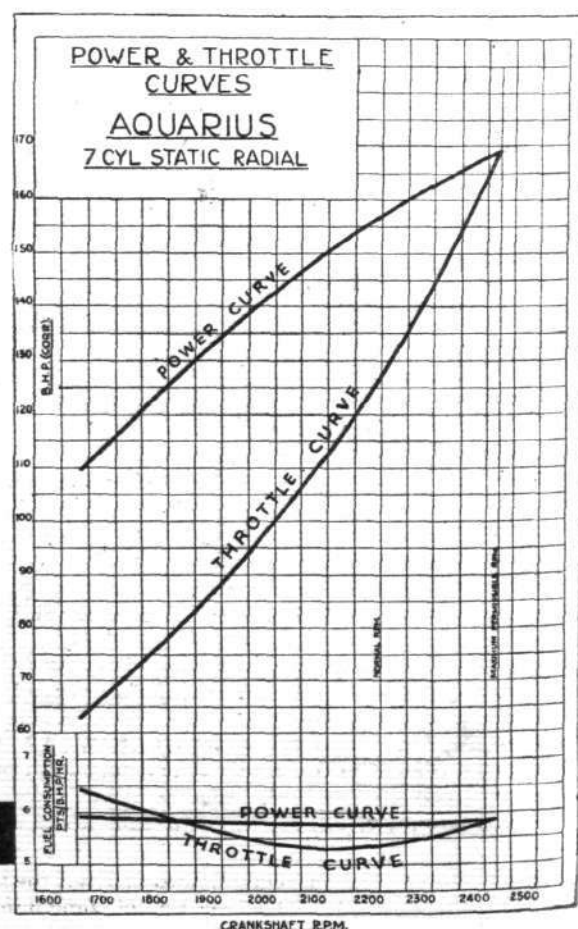


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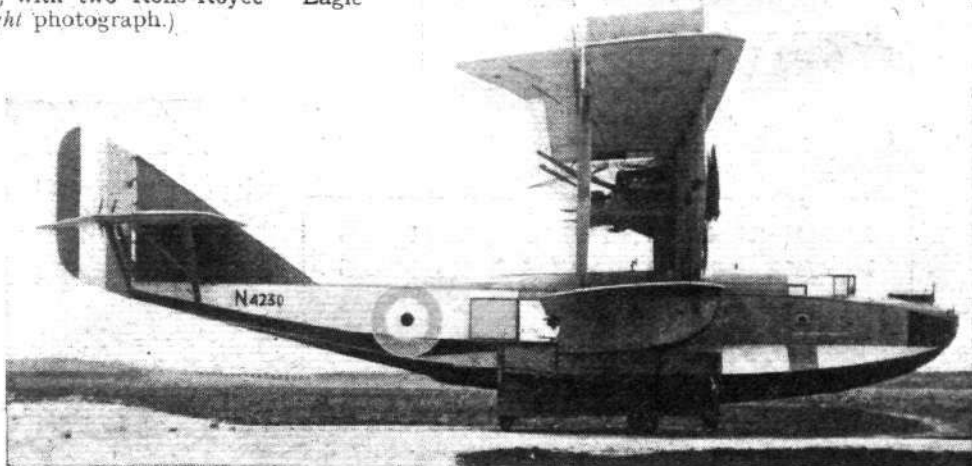
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A typical war-time flying boat, the F.3, with two Rolls-Royce "Eagle" 360 h.p. engines. (*Flight* photograph.)

on the Western Front and took heavy toll of the B.E.2C's and other British machines. Its great merit was that it had a gun which could fire through the arc of the airscrew without hitting the blades. The British reply was to design the F.E.2B. and the D.H.2. Both of them were pushers, so that the airscrew did not interfere with forward fire. The F.E. was a two-seater with the observer in the front seat, and the D.H.2 was a single-seater. Both were armed with movable Lewis guns. The idea of a fixed gun which is aimed by pointing the machine, as in the Fokker, came to the British later.

The French Nieuport was also largely used by the British at that time. During the early weeks of the Somme battles the R.F.C. pretty well drove the German aeroplanes out of the sky. Then Boelcke organised fighting *Jagd-staffels*. The German designers produced the "Albatros" D.1 and the Halberstadt D, and for a while the tables were turned. The Sopwith "Pup" and the Sopwith Triplane (the latter used almost exclusively by the R.N.A.S.)



The D.H.9 (230 h.p. "Puma") was built and used in large numbers in the war. (*Flight* photograph.)

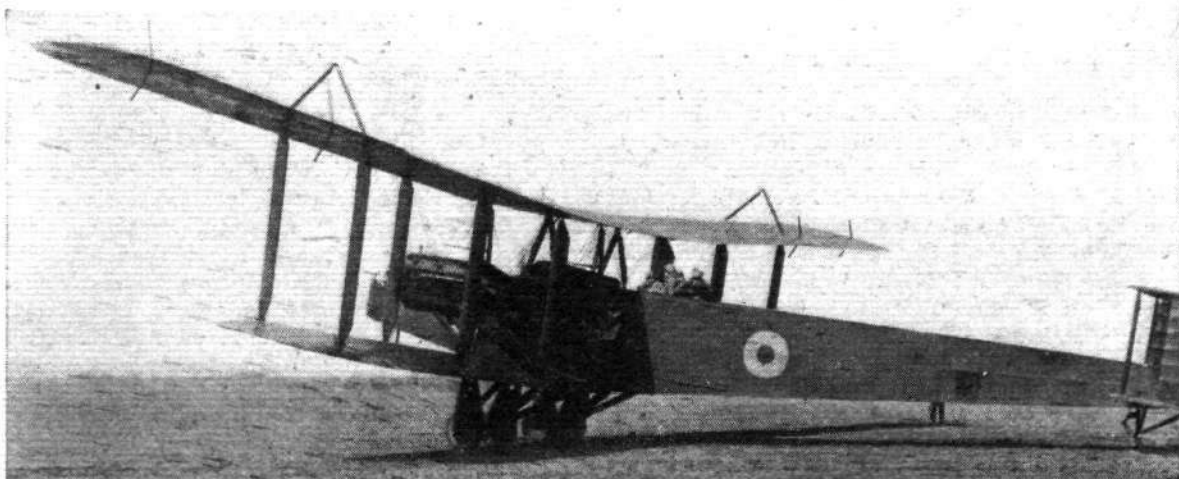
brought the British on to even terms again. The Bristol Fighter was the most formidable two-seater on either side, and took great toll of the enemy. Later versions of the "Albatros" appeared, and by the spring of 1918 the best German fighter was the Fokker triplane. By that time the British "scout" (i.e., fighter) squadrons were mainly

equipped with the S.E.5A. and the Sopwith "Camel." The two machines had different qualities, but each was as good as the best. The S.E. had one fixed Vickers gun firing through the propeller and one Lewis gun which fired over the upper plane. Not so manœuvrable as some other types, the S.E. was fast and strong. It could out-dive the German machines and so could break off a fight whenever the pilot so desired. The "Camel" was less fast, but was very quick in manœuvre, especially in a right-hand turn. It had two Vickers guns firing through the propeller arc. As day bombers the D.H.4 and D.H.9 did excellent work, while at the end of the war the Handley Page O/400 was the main British stand-by for night work.

During the war the R.N.A.S. used landplanes, floatplanes, flying boats and airships. The floatplanes gave much trouble from the flimsy nature of the floats of those days. As aircraft carriers were gradually developed the floatplanes were less used. The F.3 and F.5 flying-boats did much fine work in reconnoitring the North Sea, and so did the non-rigid airships. These last were in particular invaluable as escorts to convoys of merchant ships, and so played a great part in defeating the submarine menace. They worked in close co-operation with destroyers, and it was the surface ships which usually accounted for the U-boats by means of depth charges.

On April 1, 1918, the two flying arms of the Army and Navy were combined to form a new Service, the Royal Air Force. This proved a great economy of both material and of personnel, and helped Britain to drive home the great superiority in the air which she had attained before the end of the war. Since the Armistice the R.A.F. has undertaken many tasks independently of the Navy and Army, of which the most notable are the air control exercised in Iraq, Palestine and Transjordan, and in Aden.

F. A. de V. R.



The first British twin-engine bomber, the Handley Page O/400, had two Rolls-Royce "Eagle" engines of 360 h.p. each. This type did not come into service until near the end of the war. (*Flight* photograph.)

PRIVATE FLYING

LORD SEMPILL, HOME FROM HIS FLIGHT, SUMS UP HIS IMPRESSIONS OF CLUB FLYING IN AUSTRALIA

THERE are many aspects of aviation in Australia which might well repay a brief survey. The development of private flying, for which there is undoubtedly a considerable future, has been handicapped by the depression which has affected Australia, in common with the rest of the world, during recent years.

Figures in relation to club flying show a steady improvement, but the utilisation of the aeroplane by the station owners and those engaged in the raising of sheep and cattle—in which direction lies, perhaps, the greatest potential market for small aircraft—has not progressed as rapidly as had been hoped, for the above-mentioned reason.

The club movement may be said to have commenced in 1926, when the Commonwealth Government decided to follow the example of the Home authorities and grant assistance from public funds. Certain aero clubs were in existence before this date, but their activities were somewhat spasmodic, and they were supported mainly by ex-service pilots desirous of keeping up their flying practice. The aim of the new Government policy was to facilitate this, and also to encourage the rising generation to undergo training and generally to stimulate public interest in aviation. By September, 1926, aero clubs had been formed in Sydney and Melbourne, the Government arranging to loan to them certain "Moth" machines and spare engines. The committees of the clubs took up their work wholeheartedly and in the remaining months of the year twelve pilots had been trained for their A licences. These two clubs continued to make satisfactory progress and, in addition to training embryo pilots, organised many flying displays and pageants which helped considerably to increase public interest in the possibilities of air transport.

Assistance Extended

THIS success influenced the Government to extend their assistance, and by 1930 each state had its aero club, receiving financial support as well as being supplied with aircraft and equipment. In addition to the six chief clubs so subsidised, the authorities made available a light aeroplane to certain other clubs which had been formed in Queensland, New South Wales, and Victoria, although it was not possible at that time to afford them any financial assistance.

In spite of the general depression, the six main clubs carried on successfully through that period, although in 1931 and 1932 there was naturally a reduction in the hours flown as well as in the number of pilots trained. A new system of subsidy came into force in November, 1933. There was some doubt as to whether the financial conditions of these new agreements would work out as satisfactorily as those previously in force, but during 1934, with one exception, it was found that the clubs actually received a larger amount than they would have done on the old basis.

The increase in the case of the Victorian, New South Wales and the West Australian aero clubs was approximately 30, 60 and 33 per cent. respectively. The Queensland Club experienced a most successful year in 1934, its total flying hours exceeding that of any other club; by reason of the exceptional amount of flying, this

Australia And the Clubs

club would actually have received slightly more under the old form of subsidy for instructional and practice flying and is the exception referred to above.

The method of subsidy might be worth mentioning. The new agreements are for three-year periods and an establishment grant of £300 per annum is made to each club. The condition attached to this grant is that the club undertakes to maintain a training organisation comprising not less than two aircraft, an instructor and necessary ground personnel, and to earn the full grant it must complete not less than 600 flying hours during the year.

The Bonus System

IF this total is not reached the grant is reduced proportionately. A bonus of £20 is granted for each pupil undergoing *ab initio* training who reaches the A licence standard, and a renewal bonus of £10 for each member who renews his licence after completing the necessary period of flying in club aircraft. This bonus system is limited by certain further conditions, and the maximum amount a club can earn is influenced by the number of aircraft maintained for training purposes. The organisation with two aircraft can receive only up to ten "pilots' bonus" and twenty "renewal bonus"—a maximum of £400 per annum. This scheme provides for an increasing scale of subsidy, so that a club having eight aircraft in commission may earn forty "pilots' bonus" and eighty "renewal bonus," representing a sum of £1,600 per annum.

An interesting extension of the activities of the chief clubs may be mentioned. Arrangements are made in many cases for machines to be flown to suitable centres within a reasonable range to enable pilots and those who have commenced training to have an opportunity of keeping up flying practice. The Victorian Club, for instance, maintains an aeroplane and instructor at both Ballarat and Bendigo, and are arranging to extend such facilities to other provincial centres. The Queensland Club carries out such operations at a number of centres within a radius of 100 miles of Brisbane, and other clubs are carrying out similar work.

The following figures indicate the steady progress being made in flying by the subsidised clubs during the past three years. The number of hours flown were: 1932—8,884; 1933—9,461; 1934—11,300; "A" licences issued in 1932 were 80, and in 1934, 103.

Unsubsidised Schools

SEVERAL firms, in addition to the aero clubs, have maintained flying training schools without receiving Government assistance, notably in Sydney and Melbourne. The amount of work carried out by these organisations can be gathered from the following figures: in 1932 the total flying hours amounted to 3,052; in 1933, 1,944; and in 1934, 3,956. Pilots trained over the same period were 1932, 49; 1933, 33; and in 1934, 55.

The standard of flying in the chief Australian clubs is high, and I was much impressed by the very fine formation flying by the N.S.W. Club at Sydney when I was leaving that city. The club had mustered in force to see me off, and the display given on that occasion was equal in many respects to that we are accustomed to expect from Royal Air Force pilots.

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FROM THE CLUBS

Events and Activity at the Clubs and Schools

HERTS AND ESSEX

There are four new members, and Messrs. B. Meering, A. Poole and D. W. Grant have passed their A licence tests. Flying times for the past fortnight are 78 hr. dual and 88 hr. 45 min. solo.

LIVERPOOL

Flying time logged by the Liverpool and District Aero Club amounted to 61 hr. 25 min. despite wintry weather. There was a large entry for the Cross-Country Competition held at Hooton on Saturday, May 18.

ABERDEEN

There was no flying on two days of last week owing to high winds, snow and rain, and flying time amounted to only 6 hr. 15 min. Miss Cruickshank, of Aberdeen, has joined the school to take her "A" licence.

READING

From Phillips and Powis Aircraft, Ltd., comes an informative handbook on the Phillips and Powis School of Flying. It deals with the policy of the school, its equipment, the rates for instruction, and the flying tariff.

YEADON

Trips have been made on club machines to Newcastle, London, Manchester, Sunderland and Catterick, and 43 hours have been flown. Mr. J. H. Blackburn has joined as a flying member and Mr. E. Taylor, a member of the Aviation Group, has completed his first solo.

CAMBRIDGE

High winds, snow and hail have kept flying times down to 11 hr. 15 min. solo and 22 hr. 10 min. dual. On Sunday four members of the C.A.S.C. made flights. There are three new members, and Mr. C. W. Crawley and Mr. A. F. Bell renewed their "A" licences.

CASTLE BROMWICH

Cross-country flights have been made to Woodley, Hendon, Brooklands, Heston, Leamington, Braunstone, Filton, Hatfield, Hanworth and Tollerton. Flying times for the past fortnight were dual 40 hr. 45 min., and solo 38 hr. 55 min. Blind flying instruction is now available at the club.

NORFOLK AND NORWICH

Mr. P. R. Gold, of the Gunners, is taking instruction, and Messrs. A. J. Green and S. Stevenson have been certified by the instructor as fit to carry passengers. Mr. R. B. Finney flew over with F/O. Walker in a "Moth" from Cambridge. On Empire Air Day the club will offer flights at reduced rates.

BRISTOL

The club is having its Avro "Cadet" equipped for night flying in view of the decision of the Bristol Airport Committee to install floodlighting equipment at the airport.

Dr. Mayston and Mr. M. F. C. Smith have made their first solo flights, and Mr. D. A. Taylor has become a flying member.

SOUTHEND

A reduction in the flying rates on the club "Moth" has already been made, and it is hoped to make further reductions for flying on "Cadets" in the near future. Mr. Lawson is giving a series of lectures in the clubhouse dealing with aerial navigation and ground instruction. Several members are approaching the solo and "A" licence stages.

BROOKLANDS

Mr. Ken Waller has been appointed as chief flying instructor at Brooklands in place of Capt. Mackenzie, who is taking over a similar post at the Sywell Reserve School.

Over 100 hours have been flown this week, despite the bad flying weather. Messrs. Daybell and Whitehurst went solo, and Messrs. Munro and Cameron became pupils.

TOLLERTON

On Jubilee day the low-priced joy rides offered to the public proved highly popular. An informal dance was held in the evening.

There are seven new associate members and one flying member. The total flying time for the week ending May 9 was 40 hr. 40 min., and that for the following week 41 hr. 45 min.

LEEMING

Thirty-nine hours were flown last week, and school machines undertook a taxi trip to Haldon and a cross-country flight to Hendon. New pupils are Mr. Bulfin, Mr. Hobbes, Mr. Seiger and Mr. Kettlewell.

REDHILL

Very cold weather has not prevented 67 hr. 55 min. flying. Messrs. P. Boudier and T. T. Oliver have joined the club, and two members are taking blind flying courses. Mr. John Dade is the third member to go solo on the Autogiro, and Mr. Golege-Steele has done his landings on the "Fox Moth" for his "B" licence endorsement. On Saturday a number of members took dual instruction in night landing.

NORTHAMPTONSHIRE

Last week Mr. and Mrs. F. W. Panther became members. On the inaugural trip of Crilly Airways' Northampton-Leicester-Norwich service, the Deputy Mayor of Northampton and various other notabilities flew in the "Dragon."

The club has invited the Northants Model Aero Club to hold its rally at Sywell on June 2, at 2.30 p.m.; all model aero enthusiasts are invited.

YORK COUNTY

Although using only two machines, the club "Moth" having gone for C. of A., the hours for the month show a large increase over the figures for April. Mr. John Simon has passed his "A" licence tests. New members are Sir John Rhodes, and Messrs. Foreacre, Benson, Hodgson, Jarvis Blayney, and C. W. Hughes, the latter being the first "scholarship" pupil under the free flying scheme.

CINQUE PORTS

The records show that 45 hr. 40 min. were flown; this comparatively low figure was due to high winds and persistent cold. Mr. Charles Fane has gone solo after only 7½ hours dual. On Thursday Mr. George Lowdell called in during a test flight from Ipswich. Mr. W. E. Davis flew to Sywell and Mr. K. K. Brown made a charter trip to see the fleet in the Thames. Mrs. F. M. Morris-Davies and Mr. A. G. Phillips have joined.

KENT

The last club "Moth" has been sold and all flying is now done on "Hawks." Messrs. Tibbles and Payn have become members, and Mr. Dalton has made his first solo flight. Flying time for the week was 24 hours.

An aerobatic display by the club instructor, Flt. Lt. Barringer, proved a great attractive at the Canterbury motor gymkhana organised in aid of the local hospital. Three pupils have been allotted to the club to learn under the Young Pilots' Fund Scheme.

HATFIELD

The London Aeroplane Club recorded 61 hr. 20 min. flying last week. Among the new members is Mr. C. J. Melrose.

Preparation for the Royal Air Force Flying Club's Jubilee Air Display are progressing well. The cabin machine recently acquired by the club for the use of its members has had a busy week.

At the London Aeroplane Club garden party on Saturday, June 8, there will be demonstrations by the "Drone," an Autogiro and a glider, aerobatics, and a "high speed" event. In addition swimming and diving displays will be given. Tickets will be 5s. for visitors and 4s. for members. In the evening there will be an informal dinner and dance.

HANWORTH

A display by the Legion of Frontiersmen of defence against chemical warfare was given last Sunday.

Flying time last week totalled 29 hr. 35 min. Mr. W. P. Barker has become a member, Cdr. Hughes-Hallett, R.N., has gone solo, and Mr. N. R. Shuttleworth has passed his "A" licence tests.

The Hanworth Country Club will be reopened on June 2 by Capt. the Hon. F. E. Guest. After the opening ceremony several races will be flown; two of the prizes are silver cups.

New pupils at the Autogiro School are Major Revell Smith and Lt. Pino, an Italian Naval observer, for full "A" licence course, and Lt. Cdr. Carace, an Italian R.A.F. pilot, for a ten-hour course. Cdr. Loisel of the French Naval Airship Section, an *ab initio* trained pupil, made his first solo flight.

AERO ENGINE DEVELOPMENT

The History of Aircraft Power Plants Briefly Reviewed : From the "7 lb. per h.p." Days to the "1 lb. per h.p." of To-day

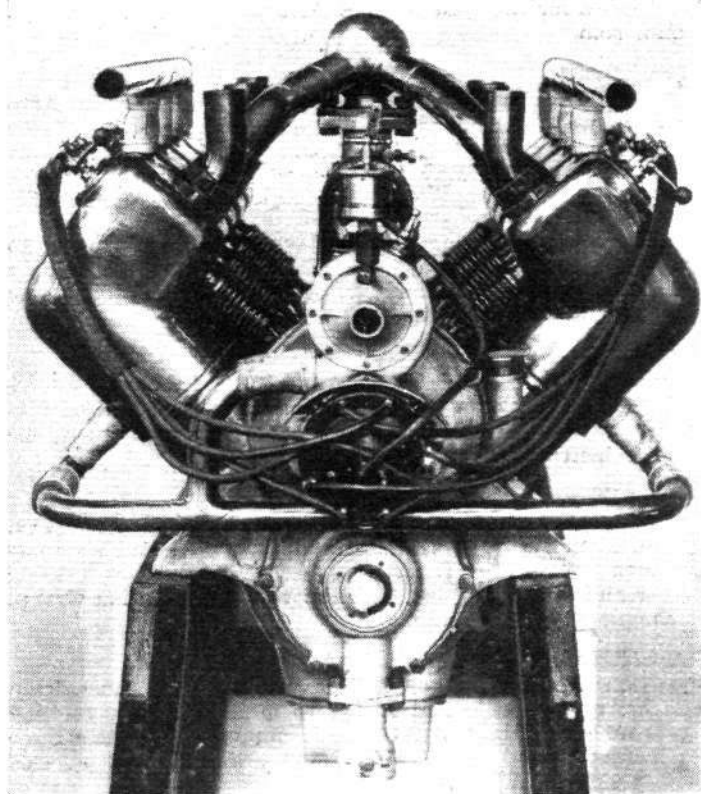
THE earliest attempts to fly were severely handicapped by the lack of suitable power plants. True, Sir Hiram Maxim had, back in the eighties, produced a wonderful steam engine plant which was extremely light for its power, as had Manley later for the Langley "aerodrome," but when the Wright brothers began their experiments they had first of all to design and build their own petrol engine, a four-cylinder in-line water-cooled, which developed something like 25 b.h.p. From the fact that this was the first engine to fly and to be specifically designed as an aero engine it cannot, however, be argued, that all subsequent aero engines have been developed from it. That is far from being the case. The Wright engine of the early days got the famous brothers into the air, but was not perpetuated, and very soon other engines came into being which laid the real foundations for the aero engines in general use to-day.

Not until 1908 and 1909 did flying in Great Britain begin to assume serious proportions. Not a great many engine types were then available, a few of the best-known—apart from the low-powered J.A.P. motor cycle engines used by A. V. Roe in his early work—being the Vivinus, the E.N.V., the N.E.C. and the Green.

The E.N.V. engine, built by the London and Parisian Motor Co., was an eight-cylinder vee-type rated at 80 b.h.p. It had a bore of 100 mm. and a stroke of 130 mm., and weighed about 300lb. dry, or nearly 4lb. per h.p. A feature of this engine was that it had electrolytically-deposited copper water jackets.

A very simple engine which showed considerable promise, but which ultimately proved to be too severely handicapped by its heavy fuel consumption, was the N.E.C., built by the New Engine Company. This was made in three models, with two, four and six cylinders respectively, and was a water-cooled two-stroke. A vee type was introduced later. The engine was used by several of the early pilots, notably in the Short-Wright biplanes. The four-cylinder model was rated at 40 b.h.p. and weighed 290 lb.

By far the most reliable British water-cooled aero engines

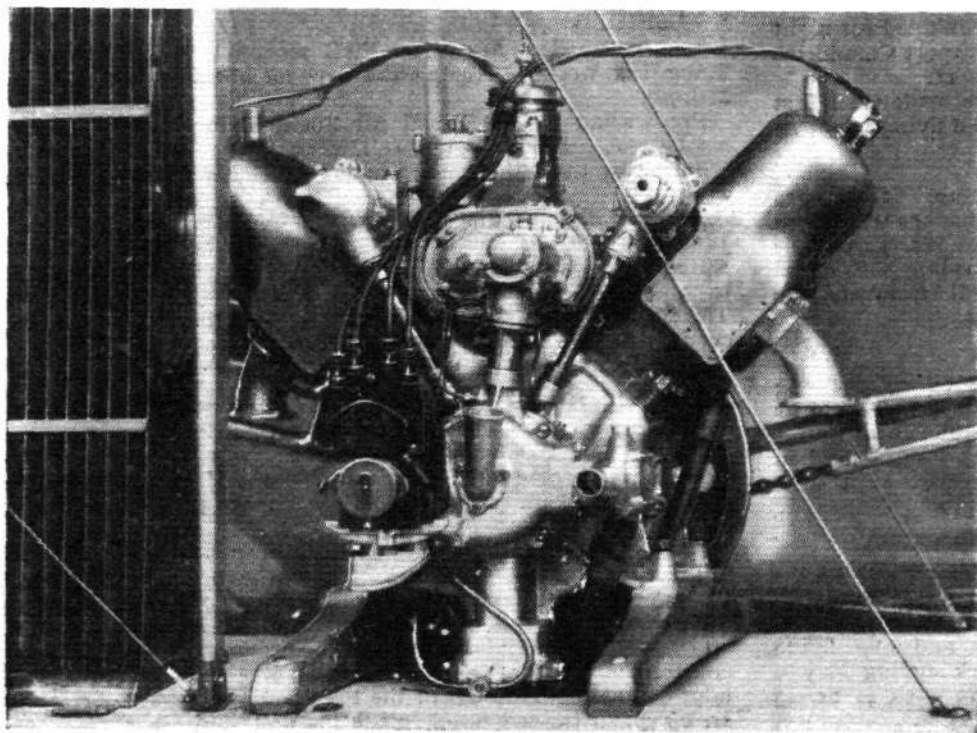


Originally designed in England but first built in France, the E.N.V. engines of 1909-1910 were subsequently constructed in England also. (*Flight* photograph.)

of the 1909-1911 period were the Greens, of which two four-cylinder models and one six-cylinder were produced. Most successful were the two former, rated at 30 b.h.p. and 50 b.h.p. respectively, the corresponding weight figures being 160 and 236 lb. respectively. The Green engines were of the water-cooled vertical in-line type, and had copper water jackets, with a sliding joint to allow for expansion. Overhead camshafts were used, and the cam rockers were so arranged that they could be tilted back to give access to the valves.

Air-cooled aero engines were somewhat slow in making their appearance, and, as far as Great Britain was concerned, foreign inspiration had to be relied upon at first. Three French types established lasting successes in the early days of flying—the Anzani, the Renaults and the Gnômes.

The first Anzani aero engine was a part-radial or "fan-shape," with its three cylinders forming, so to speak, the upper half of a six-cylinder air-cooled radial. It was with an engine of this type that Blériot flew across the English Channel in 1909. The engine developed about 25 h.p., but overheated badly, and it was fortunate for Blériot that, half-way across, a providential rainstorm partly



The N.E.C. water-cooled two-stroke was first produced as a vertical engine and later as a vee type. (*Flight* photograph.)

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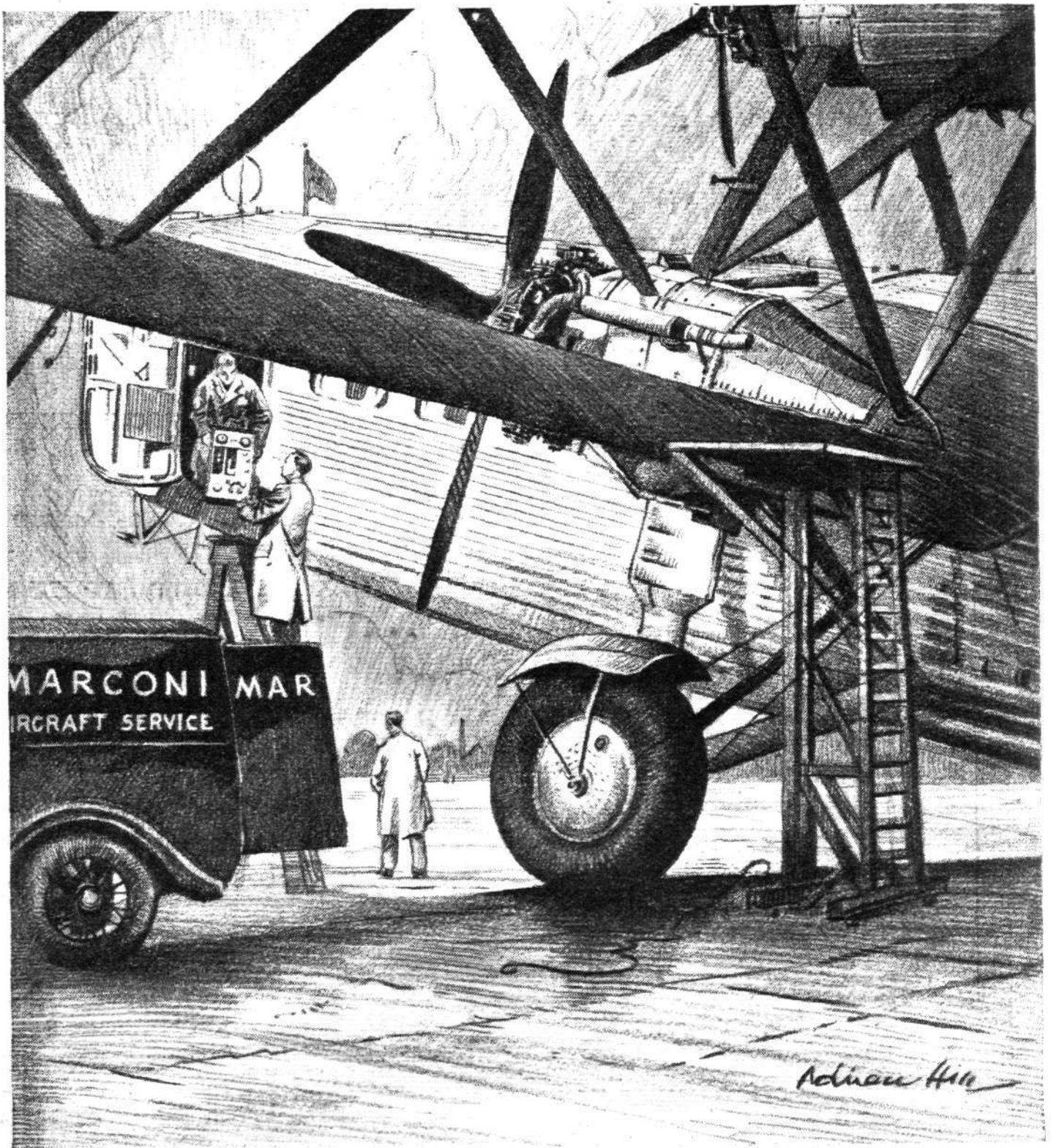
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Although a plain four-cylinder-in-line engine, the Green of 1909 and onwards had many interesting features and was a favourite with many of the pioneers. It was made in 35, 50 and 100 h.p. models. (*Flight* photograph.)

"water-cooled" his engine enabling him to complete the flight. In his next model M. Anzani arranged the three cylinders symmetrically, i.e., in the form of an inverted "Y." This engine developed 30-35 b.h.p. It was followed by a six-cylinder model, which was really two "Y" types put together on a common crank case, with the two sets of cylinders staggered in relation to one another. All the early Anzani engines had mechanically-operated exhaust valves in the cylinder heads, but the inlet valves were automatic in action, the suction of the piston on the induction stroke opening the valve against a spring.

Another French designer who achieved considerable success was Renault. The Renault engines were air-cooled vee eights, with a fan mounted on the flywheel and air scoops to direct the air flow. The 1909 Renault was rated at 60 h.p. and weighed 264 lb. The airscrew shaft, it might be mentioned, was mounted on the forward end of the camshaft, so that a two-to-one reduction gear was provided.

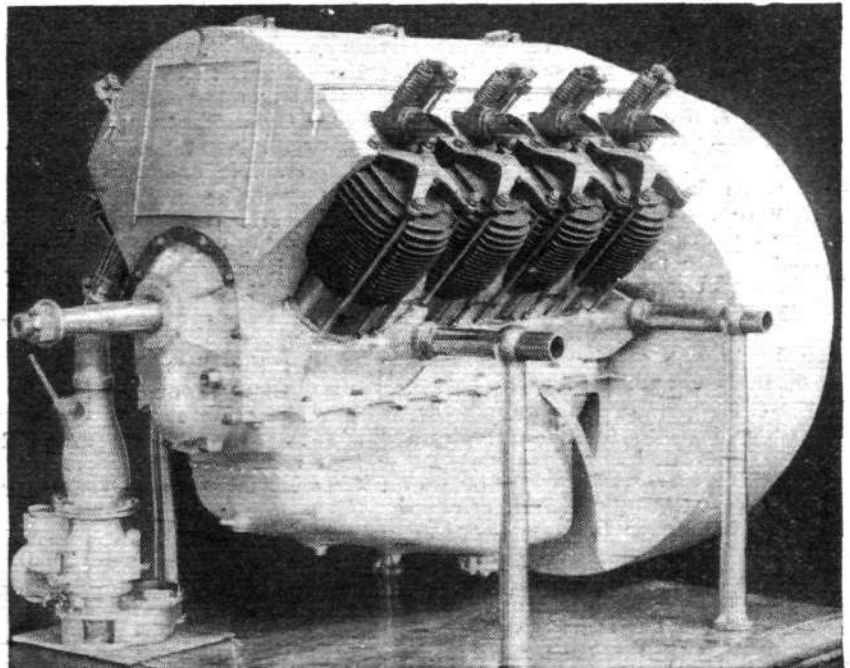
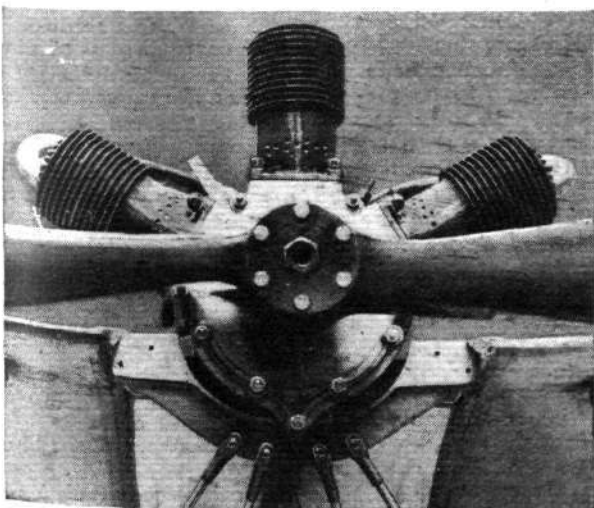
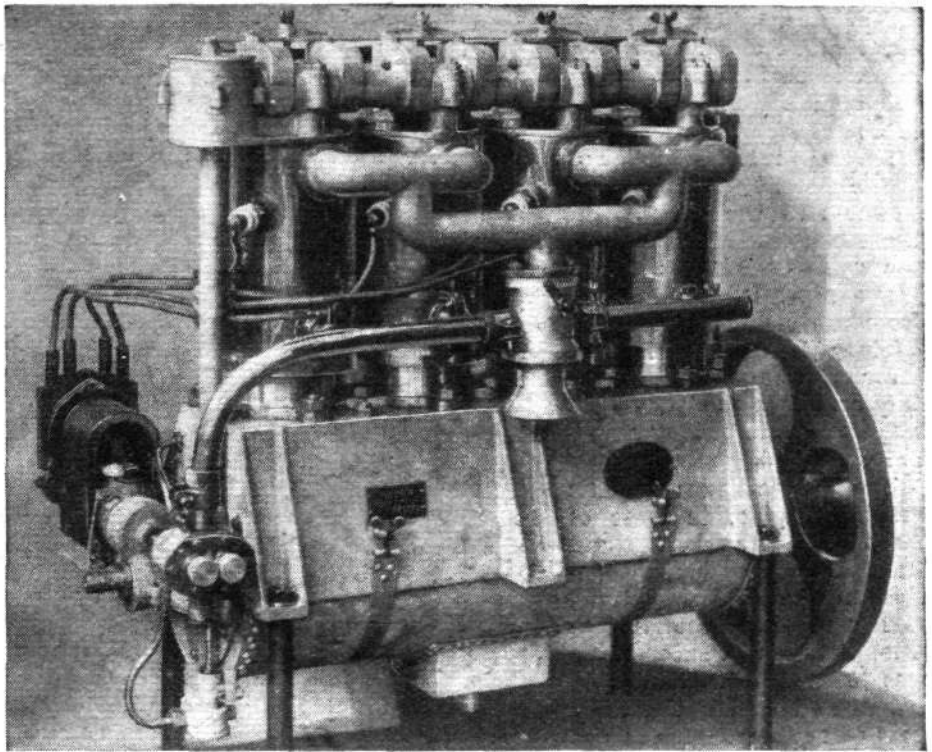
With the advent, in 1909, of the Gnome rotary engine designed by M. Seguin, not only French aviation but British aviation got really started on its career. Before that time engines had been extremely heavy, mostly of low power, and not too reliable. At first reliability did not count for quite so much as weight, many of the early efforts being directed towards getting into the air rather than towards staying there a long time. The 50 h.p. Gnome weighed but just over three pounds per horse power, and its output was a good deal more than most experimenters of that time had been accustomed to have available, so that it was small wonder that, as soon as the first prejudice had been overcome, aircraft designers and pilots fell over each other in an effort to obtain Gnome engines.

That there should be prejudice at first was not surprising. Here was a very light contraption in which the cylinders were disposed symmetrically around the crank

case and whirled around with it, with the stationary crankshaft as a pivot. Truly, there was reason enough to be sceptical. It soon became apparent, however, that the Gnome was a power plant to be reckoned with, and the superb workmanship was a long way ahead of that to be found in most contemporary engines. In fact, the workmanship had to be good; the engine depended upon that for its proper functioning.

Imagine seven cylinders arranged around the crank case and rotating with it at 1,200 r.p.m. The pistons had in their crowns the automatic inlet valves, which had balance weights attached to them, and, in addition, very light springs. At the normal running speed the weights just kept the valves on their seatings. When the induction stroke occurred, the valve opened against the weak spring and the charge was admitted to the top of the piston. Push rods and rockers for the exhaust valves also had to be nicely balanced, and every cylinder assembly had to be of exactly the same weight as the others, or vibration would have become serious.

The crankshaft was, of course, hollow, and the charge reached the cylinders *via* the crank case and the valves in



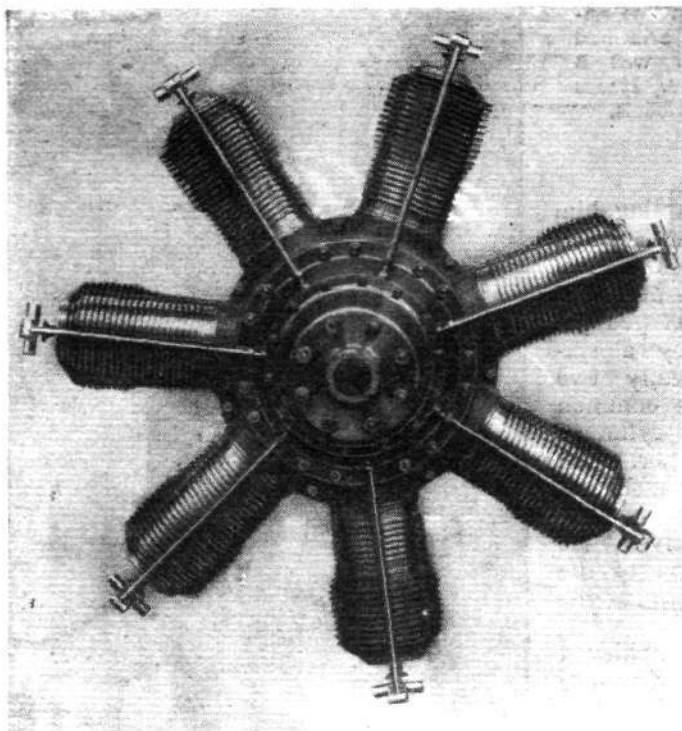
Air-cooling in the early days was exemplified by these two French engines, the three-cylinder Anzani of 25 h.p. (note the circular exhaust ports in the cylinder walls) and the eight-cylinder 60 h.p. Renault. The latter was cooled by a fan on the flywheel. (*Flight* photographs.)

the pistons. When an inlet valve stuck open, extremely impressive flames used to shoot back from the air intake!

Several rotaries followed the Gnome, such as the Le Rhône and the Clerget, but these had the inlet valves in the cylinder heads and external pipes leading to them from the crank case; consequently it was possible to throttle them, whereas the only control of the "Gnome" was the famous "Blip" switch.

The so-called "static radial" engine, in spite of Anzani's early work, and that of other French designers like R. E. Pelterie, was slow in materialising. The Salmson Canton-Unné was made in England just before and during the early part of the war, but did not survive for very long. One air-cooled radial, the Isaacson, appeared about 1913, but failed to achieve any popularity. It was not until the late war and early post-war period that the type was revived by Mr. Bradshaw of the A.B.C. Engine Company, whose "Wasp" and "Dragonfly" engines (170 h.p. seven-cylinder and 320 h.p. nine-cylinder respectively) did a fair amount of flying.

Mr. R. Fedden was another designer who believed in the radial, and he designed the early "Cosmos" engines which were later taken over by the Bristol company and have developed via the "Jupiter" into the "Pegasus" and "Mercury" engines of the present time. The Armstrong-



The engine which made real flying possible: the 50 h.p. seven-cylinder Gnome rotary, which weighed but little more than 3 lb. per h.p. The inlet valves were in the piston heads and were automatic in action. (Flight photograph).

Siddeley radials, which include a very extensive range, are all post-war productions.

Our modern twelve-cylinder water-cooled vee engines may be said to be descended from some of the earliest engines used in aviation via the Rolls-Royce "Falcon" and "Eagle" types, the war-time Wolseley-Hispano and the American "Liberty." For a time, the "W" or "Broad Arrow" type of water-cooled was extremely popular, the most famous example being the Napier "Lion" series.

The relatively low-power air-cooled in-line engine had no counterpart in the early days, but is tremendously successful in modern times. In England the type may be said to have started with the "Cirrus" and developed via the "Gipsy" and "Hermes" into the latest Napier-Halford types, the "Rapier" and "Dagger," which are, in effect, four in-line engines mounted on a common crank case.

In view of the modern attempt to produce a steam-cooled engine it is worth recalling that the early Antoinette engines of 1909-1910 or so were at least partly steam-cooled, the water in the cylinder jackets being permitted to turn into steam, which was then turned into water again by large condensers, usually mounted along the sides of the fuselage. They were eight-cylinder vee engines and weighed but 3.5 lb./h.p. It is also interesting to note that they used direct fuel injection. C. M. P.

CORRESPONDENCE

The Editor does not hold himself responsible for the opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

SHOOTING THE 'CHUTIST

[3043] Referring to your article on parachutes in war which appeared in last week's issue, it appears to me that the seriousness of the question is somewhat exaggerated.

If the airmen jump over enemy territory, when they are certain to be made prisoners on reaching the ground, there is, as you point out, no need to shoot them during their descent.

However, if a pilot is forced to jump over his own territory obviously he will not open his parachute until the latest possible moment, say between 1,000 and 1,500 ft. No enemy pilot will risk descending to this altitude over enemy territory merely to finish off the unfortunate occupants of a disabled aircraft, while it is also obvious that a human body falling through space under the influence of gravity is no simple target for an enemy pilot to hit.

Edgware.

J. S. WILKINSON.

delight in the art of bombing simply because it brings war up to the garden gates of the bow-fronted flag-waggers who would do anything to rule out the possibility of being messily damaged after dinner while "the dear boys are out there."

The pacifistically inclined youngster of to-day is usually told that he has no backbone, yet he is the only person with the moral courage to be prepared to try a new method of ensuring peace. Most of us would rather risk extinction as truly civilised people than accept it as barbarians.

Anyway, the little picture of a well-brought-up pilot weighing up his own inclinations and his duty to his country, while watching his friend the enemy floating down, reminds me of a bunch of people forming a committee to decide what to do after the hotel has caught fire. It is, in fact, just another piece of control applied to the uncontrollable.

Gravesend.

TITUS OATES.

NUTS TO CRACK.—No. 5.

[3045] I am sure your correspondent "E. W. W." [3040] will be amused at the procedure we adopted in order to persuade the inefficient airscrew to drag the heavily loaded aircraft in question off the aerodrome:—

(1) Four helpers would push the aircraft forward until it outran them.

(2) For a few hundred yards the aircraft would rumble along with its tail held high at the best wing-drag angle.

(3) The actual "unstuck" was timed to coincide with the crossing of a ridge on the aerodrome which, generally, would bump the aircraft off the ground. If that failed, we had to start all over again!

London, W.C.2.

N. COMPER.

[3044] As one of the despised and rejected rationalists I must protest against the preposterous idea that anyone, whether hanging by an umbrella or hanging from an aeroplane, should be "immune from attack." Your ideas are perfectly logical, but do you not realise that sooner or later an airman of nation A would be shot while descending over nation B?—quite by accident, of course. All people of nation A would then open fire on all enemy parachutists. Such is reprisal. Once broken, rules of warfare are broken for good.

You will notice that no really useful rule is ever made. The Hague, for instance, might order all those who sign declarations of war to commit suicide as an indication of confidence in its necessity. What a lot of ingenuity would then be used in circumventing the circumstances that lead up to war! I



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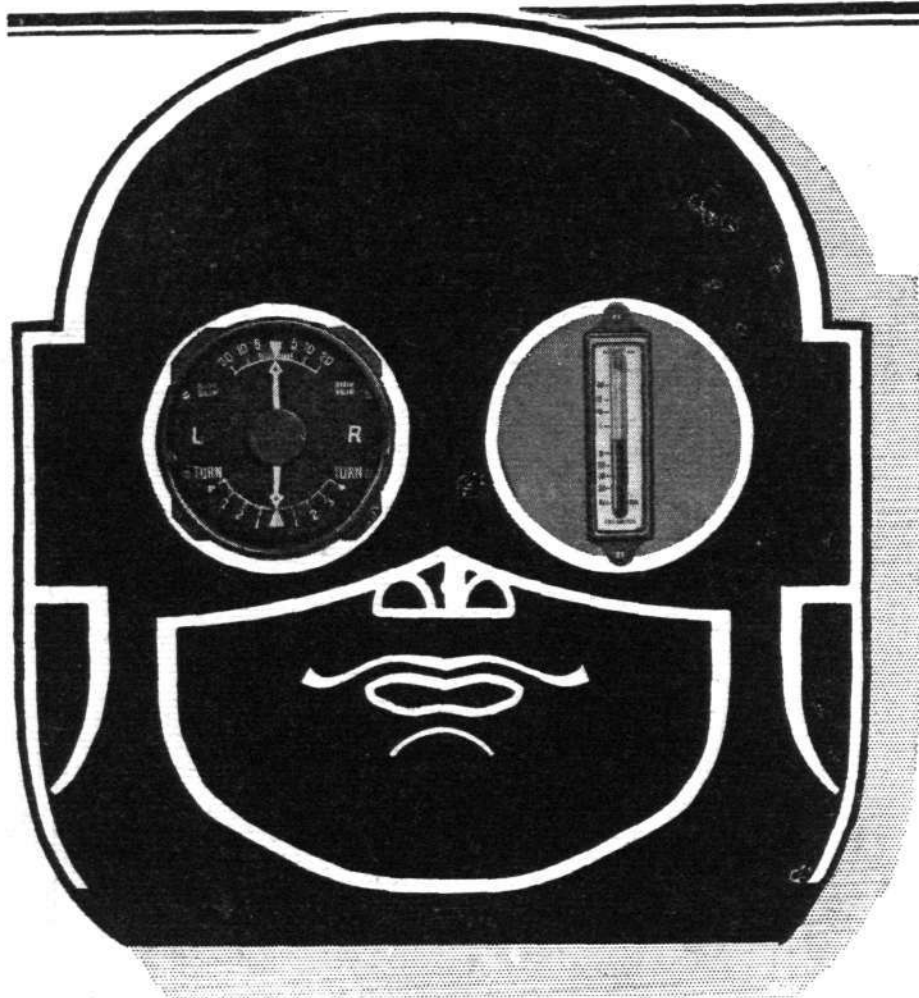
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AIR MINISTRY ANNOUNCEMENTS



ON DUM DUM AERODROME: The Vickers "Vildebeests" ("Pegasus") of No. 100 (Bomber) Squadron at Calcutta en route for Risalpur from Singapore. The return journey amounted to 7,000 miles.

NOMENCLATURE OF AIRCRAFT—"LONDON"

The official name of the Saunders-Roe general-purpose flying boat fitted with "Pegasus" engines is "London."

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Service personnel engaged on duty at the Display are each entitled to tickets of free admission for three guests in addition to their own free admission duty badge or brassard.

Service personnel at home who, for service reasons, are unable to attend the Display, but whose relatives desire to do so, are entitled to two tickets of free admission.

Service personnel stationed abroad whose relatives at home desire to attend the Display are entitled to two tickets of free admission

(which are issuable only in response to application from the relatives themselves). Applications for such tickets, supported by definite evidence as to the identity of the applicant, may be submitted as follows:—(a) Officers on leave from abroad and relatives of officers serving abroad—to the Secretary, Air Ministry. (b) Airmen on leave from abroad and relatives of airmen serving abroad—to the Officer i/c Records, Ruislip, Middlesex, who, if satisfied that the applicants are qualified, will demand tickets from the Display Secretary for them.

Regular personnel of the Royal Navy and Army or of the Dominion Air Forces attached to the Royal Air Force are entitled to the same privileges with regard to free admission for themselves and guests to the R.A.F. Display as personnel of corresponding ranks in the Royal Air Force.

The civilian staff of the Air Ministry, and the civilian staff and civilian employees at Air Ministry outstations, who desire to attend the Display this year may each be supplied with not more than two tickets at half the normal price of admission to the 10s., 5s., or 2s. enclosure (including admission at the entrance gates).

The privilege of attending the Display at a reduced price of admission has again been extended to non-air force members of light aeroplane clubs, who may each be supplied with not more than two tickets for the price of one, admitting to the 10s. enclosure (including admission at the entrance gates).

The scale of charges applicable generally for admission to the R.A.F. Station, Hendon (which includes admission to the enclosures specified) is as follows:—

(i) Boxes (to hold six persons, including children), £7-£5-£4.

according to position. It should be noted that the number of boxes is limited, and they are usually booked some time before the Display. Each box is provided with six chairs. To avoid crowding on the rails and thus blocking the view of people behind, the number allowed in each box must not be exceeded. Six special badges are issued to purchasers of boxes; these badges also admit the holders to the 10s. enclosure.

(i) *Enclosures*:—10s., 5s., and 2s. each person; children under twelve years of age at half-price—all others at full price.

A large number of chairs and forms are provided free in all enclosures, but no guarantee of a free seat is given or implied by the Display Committee. Free seats cannot be reserved.

There is only one 10s. enclosure—which is at the southern end of the aerodrome. In this enclosure are located the Royal and various other special enclosures, for which special badges of admission are required. There are two 5s. enclosures, one on the east (Watford Way) side and one on the west (Colindale) side of the aerodrome. There are two 2s. enclosures (for pedestrians only), one on the north-east (Mill Hill) side and one on the west side

of the aerodrome. There is an enclosure for pedestrians only in Sunny Hill Fields, near Hendon Church, admission 1s. (children under twelve years of age at half-price). Seats on stands in the enclosures can be reserved on payment of charges (no half-price concession) additional to normal admission fees, as follows:—3s. for grand stand, 2s. 6d. for other stands.

Advanced bookings for boxes, 10s. and 5s. enclosures and seats on stands, and for motor vehicles can be made at any time on prepayment of the authorised charges, through the following:—The Secretary, R.A.F. Display Committee, R.A.F. Station, Hendon, The Hyde, N.W.9 (Telephone: Colindale 8242), any R.A.F. station headquarters, Secretary, R.A.F. Benevolent Fund, Royal Air Force Club, London, or the usual theatre and entertainment ticket agencies, which sell R.A.F. Display tickets on commission and charge the usual booking fees. A special memorandum will be issued in the Air Ministry with regard to the issue and sale of tickets to service personnel and civilian staff of the Air Ministry. Advanced bookings for the 2s. enclosures can be made only for parties of twenty persons and over, through recognised central organisations, e.g., clubs, etc.

ROYAL AIR FORCE GAZETTE

London Gazette, May 14, 1935

General Duties Branch

Lt. J. P. G. Bryant, R.N., is re-attached to the R.A.F. as a Flight Lieutenant with effect from May 1 and with seniority of April 1.

The following Pilot Officers on probation are confirmed in rank:—C. M. B. Renshaw (Jan. 13); F. R. Nugent (April 20).

The following Pilot Officers are promoted to the rank of Flying Officer:—M. D. Thunder (Jan. 15); I. A. Scott (Feb. 12); G. C. Tomlinson (Feb. 14); G. A. M. Pryde (April 2); J. C. Evans (April 23).

F/O. J. W. Burgess is transferred to the Reserve, class A (May 1).

Medical Branch

Flt. Lt. J. D'I. Rear, M.R.C.S., L.R.C.P., is promoted to the rank of Squadron Leader (May 1).

Chaplains' Branch

G. H. Nicholson is granted a short service commission with the relative rank of Squadron Leader with effect from and with seniority of May 1.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

H. O. Woodhouse is granted a commission as Flying Officer in class A (April 30).

The following are transferred from class A to C:—Ft. Lt. R. S. Barbour (May 1); F/O. J. J. Scholes (May 13); F/O. R. W. Barton (May 22).

The following are transferred from class AA (ii) to class C:—P/O. W. L. M. Merrett (April 23); P/O. on probation J. M. Scott (March 14).

The following resign their commissions on appointment to commissions in the Auxiliary Air Force:—F/O. A. M. MacLachlan (April 28); P/O. H. St. J. Coghlan (April 30).

AUXILIARY AIR FORCE

General Duties Branch

No. 600 (CITY OF LONDON) (FIGHTER) SQUADRON.—The following are granted commissions as Pilot Officers:—A. M. MacLachlan (April 28); H. St. John Coghlan (April 30). F/O. G. L. S. Dawson-Damer, Viscount Carlow (Lt. 11th Hussars, R.A.R.O.), is promoted to the rank of Flight Lieutenant (April 15).

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—P/O. G. C. Pinkerton is promoted to the rank of Flying Officer (April 18).

No. 604 (COUNTY OF MIDDLESEX) (FIGHTER) SQUADRON.—Ft. Lt. C. P. Gabriel is promoted to the rank of Squadron Leader and appointed to command of the squadron (April 8); F/O. J. Cherry is promoted to the rank of Flight Lieutenant (April 8).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Marshal.—Sir E. R. Ludlow-Hewitt, K.C.B., C.M.G., D.S.O., M.C., to Headquarters, R.A.F., India, 27.3.35; on appointment as Air Officer Commanding vice Air Marshal Sir J. M. Steel, K.C.B., K.B.E., C.M.G.

Wing Commander.—R. L. Stevenson, M.B.E., to Headquarters, Western Area, Andover, 1.5.35; for Armament duties vice Wing Cdr. P. Huskinson, M.C. J. J. Breen, to Headquarters, R.A.F., Middle East, Cairo, 29.3.35; for Air Staff duties at Khartoum vice Wing Cdr. A. Coningham, D.S.O., M.C., D.F.C., A.F.C.

Squadron Leaders.—E. J. D. Townesend, to Headquarters, Western Area, Andover, 27.4.35; for Equipment (Engineer) Staff duties. P. Warburton, M.B.E., to Special Duty List, 1.5.35; for duty as Assistant Secretary (Air) to Committee of Imperial Defence vice Wing Cdr. E. J. Hodsoll, C.B. H. J. Collins, to H.M.S. *Courageous*, 6.5.35; for flying duties vice Sqn. Ldr. H. V. Drew. G. E. Wilson, to Headquarters, Fighting Area, Uxbridge, 11.3.35; for Air Staff duties.

Flight Lieutenant (Acting Sqn. Ldr.).—H. N. Thornton, to Special Duty List, 26.4.35; on appointment as Air Attaché, Brussels.

Flight Lieutenant.—L. R. W. Tillard, to R.A.F. Depot, Uxbridge, 25.4.35. S. L. Blunt, to Station Headquarters, Biggin Hill, 6.5.35. M. C. Lassetter, to Headquarters, R.A.F., Iraq, 1.5.35; for Air Staff Intelligence duties on appointment to Short Service Commission. A. P. Bett, to No. 2 Flying Training School, Digby, 7.5.35. E. J. Foulkes-Jones, to No. 3 Flying Training School, Grantham, 7.5.35.

Flying Officers.—M. W. L'I. La V. Baker, to Armament Training Camp, Leuchars, 2.5.35. C. M. Windsor, to Armament Training Camp, Leuchars, 2.5.35. L. H. Anderson, to No. 3 Flying Training School, Grantham, 2.5.35. R. A. C. Barclay, to No. 27 (B) Squadron, Kohat, India, 30.3.35. C. Broughton, to No. 27 (B) Squadron, Kohat, India, 30.3.35. R. A. C. Carter, to No. 11 (B) Squadron, Risalpur, India, 31.3.35. T. G. L. Gale, to No. 27 (B) Squadron, Kohat, India, 30.3.35. R. J. Gosnell, to No. 20 (Army Co-operation) Squadron, Peshawar, India, 30.3.35. P. H. Hamley, to No. 11 (B) Squadron, Risalpur, India, 31.3.35. H. P. Jenkins, to No. 6 (B) Squadron, Ismailia, Egypt, 17.4.35. D. J. P. Lee, to No. 39 (B) Squadron, Risalpur, India, 31.3.35. C. R. D. L. Lloyd, to No. 20 (Army Co-operation) Squadron, Peshawar, India, 30.3.35. J. C. Pope, to No. 39 (B) Squadron, Risalpur, India, 31.3.35. M. H. Rhys, to No. 28 (Army Co-operation) Squadron, Ambala, India, 30.3.35.

P. S. Salter, to No. 39 (B) Squadron, Risalpur, India, 31.3.35. *Pilot Officers.*—E. F. E. Barnard, D. O. Finlay, W. W. Loxton, N. F. Simpson, K. G. Stodart, to R.A.F. Depot, Uxbridge, 30.4.35; on appointment to Permanent Commissions. A. O. D. Cox, to No. 60 (B) Squadron, Kohat, India, 30.3.35.

Acting Pilot Officers.—A. A. McMath, to No. 55 (B) Squadron, Hinaidi, Iraq, 6.4.35. S. G. Pritchard, to No. 30 (B) Squadron, Mosul, Iraq, 6.4.35. G. A. Richmond, to No. 30 (B) Squadron, Mosul, Iraq, 6.4.35. R. E. Sharp, to No. 70 (B.T.) Squadron, Hinaidi, Iraq, 6.4.35.

Accountant Branch

Flight Lieutenant.—W. S. Calder, to Station Headquarters, Pembroke, 3.5.35.

Stores Branch

Flight Lieutenant.—L. Horwood, M.C., to Aircraft Depot, India, Karachi, 26.4.35.

Flying Officer.—R. J. Williams, to No. 2 (Indian Wing) Station, Risalpur, India, 28.3.35.

Medical Branch

Wing Commander.—E. A. Lumley, M.C., to Headquarters, A.D.G.B., Uxbridge, 13.5.35; for duty as Principal Medical Officer (Hygiene), vice Wing Cdr. T. Montgomery.

Flying Officer.—G. H. Morley, to Princess Mary's R.A.F. Hospital, Halton, 6.5.35.

Group Captain.—F. C. Cowtan, to Headquarters, R.A.F., Middle East, Cairo, 13.4.35; for duty as Principal Medical Officer vice Group Capt. W. Tyrrell, D.S.O., M.C.

Squadron Leaders.—E. C. K. H. Foreman, to R.A.F. Hospital, Cranwell, 1.5.35; for duty as Medical Officer. C. T. O'Neill, O.B.E., to No. 3 Flying Training School, Grantham, 1.5.35; for duty as Medical Officer.

Flight Lieutenants.—P. D. Barling, to R.A.F. General Hospital, Hinaidi, Iraq, 30.3.35. G. A. M. Knight, to R.A.F. Hospital, Aden, 25.4.35. G. M. Anderson, to No. 1 Armament Training Camp, Catfoss, 3.5.35.

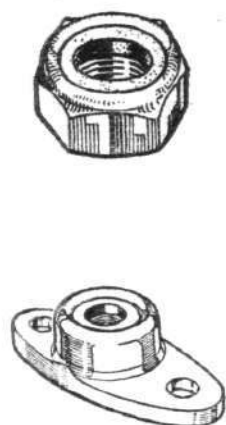
Flying Officer.—R. G. James, to No. 3 Flying Training School, Grantham, 1.5.35.

Chaplains Branch

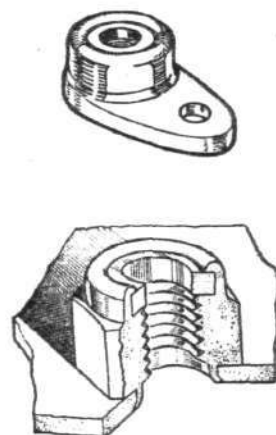
Rev. G. H. Nicholson, to Home Aircraft Depot, Henlow, 1.5.35; for duty as Chaplain (C. of E.) on appointment to a short service commission.

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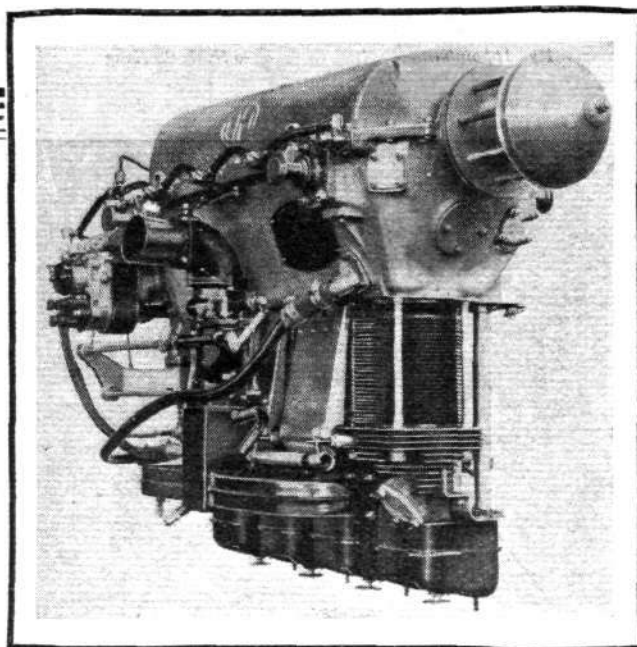
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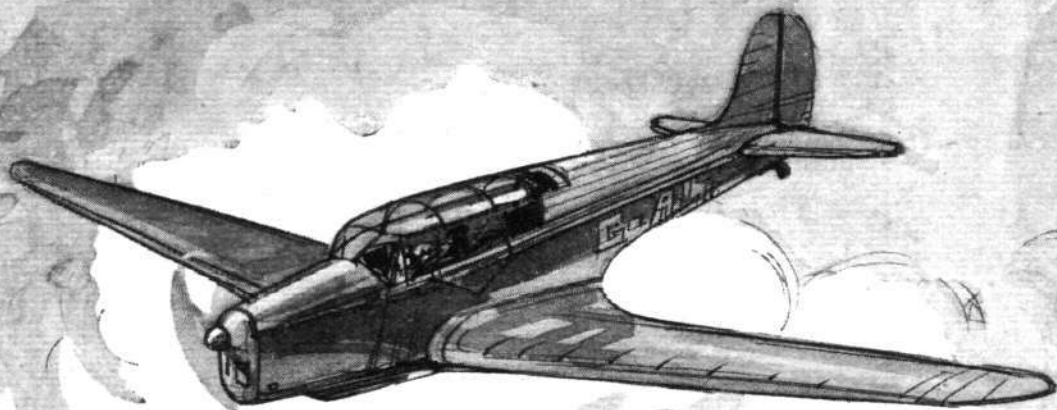
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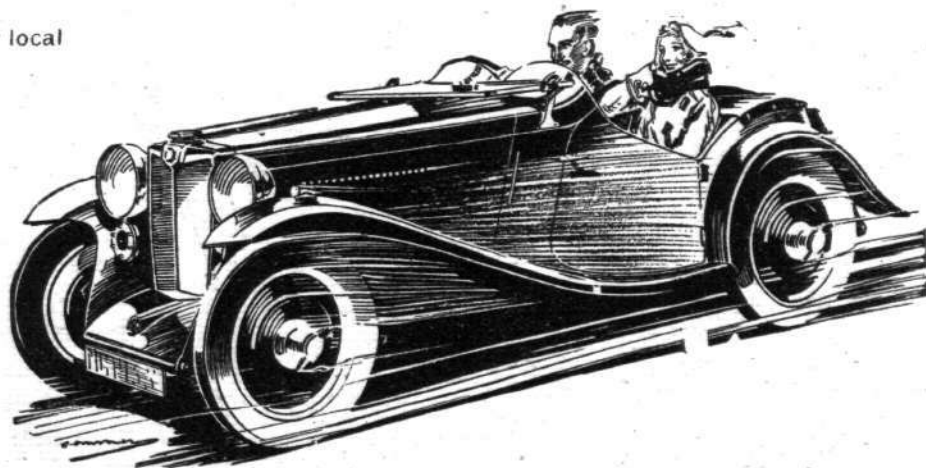
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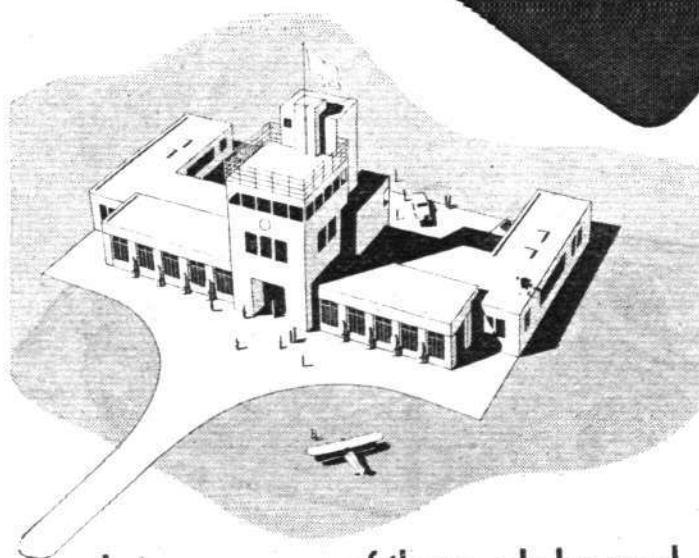
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STANDARDISE PERFORMANCE FIGURES!

A Plea for a Rational System Which Will Enable Accurate Comparisons to be Made

By C. N. COLSON

AT what speed does it cruise? How fast does it climb? What is the payload? These and all the other questions asked by people about to buy aeroplanes seem quite easy to answer—and are; but, unfortunately, no two manufacturers appear to have the same idea as to what form the answers should take.

Ask any one of the many consultants and agents who deal with the queries of those who wish to buy aeroplanes to produce a comparative table of, say, the cruising speeds of half a dozen different aircraft. You will be astounded at the amount of work which the compilation of such a table entails. Every manufacturer has a different idea of what cruising speed is. Some say it's the speed at 85 per cent. full speed, others say it's at 75 per cent. throttle opening; and so it is with all the other figures which an operator must have if he is to form a reliable estimate of the running costs of a machine, and into which he must go before he can decide upon which machine to purchase.

In recent years we have heard a great deal about standardisation, but in a conservative country like ours it takes a long, long time before the ways of old-established businesses can be changed or the need for an innovation drummed into the heads of aged directors. I suggest that there is no more immediate need in the aviation industry than the standardisation of aircraft performance figures. When brought about it would prove of inestimable value in helping sales, especially if it is made a matter of international agreement, which is what I venture to hope may be the outcome of our example.

Cruising Speed

Let us take a few of the points which cause most trouble in the existing circumstance. First, there is *Cruising Speed*: This is, perhaps, one of the most varied of all performance figures. Some manufacturers say that it is the speed at a certain throttle setting, while others give it as a percentage of the top speed. Some specify the altitude, some the engine revolutions, and some both. All of which makes it almost impossible to compare similar aircraft without entering into lengthy correspondence. Cruising speed is primarily a concern of the operator, and is regulated by a number of factors, such as the altitude of the route to be flown over, the length of time it is wished to run the engines between overhauls, and, in fact, all those things which help or hinder the success of an air line. Cruising speed in privately owned aircraft is, more often than not, merely a matter of luck.

I suggest that there is no need for quoting a cruising speed at all. It is governed so much by the desires of each owner that it would be far better only to give the top speed, at the rated altitude of the engine, reduced to standard atmospheric conditions. This would give operators a definite basis upon which to work and allow them to make accurate comparisons.

Next on the list comes that vexed question of *Load*. Has anyone ever heard two manufacturers agree on the subject of payload and disposable load? For example, are cabin furnishings included in payload? Is the weight of the crew to be deducted before the disposable load is reckoned up? Are instruments included in the tare weight? And so I could go on; it is an extremely difficult subject, and one which wants thrashing out. After many years of preparing performance tables for publication I have come to the conclusion that tare weight should be the weight of the aircraft ready to fly in every respect, but without crew,

fuel, oil, water, cabin furnishings, and with the standard instruments as prescribed by the I.C.A.N. The difference between this weight and the maximum permissible weight I would call the load. It would then be entirely up to users to add what extras they wanted in the way of instruments, wireless equipment, furnishings, and the amount of fuel and oil they wished to carry, knowing that, after allowing for the weight of the crew, they would have as payload whatever was left. Call load "disposable load" if you like, but payload is far too easily varied for it to be included in makers' lists.

Climb and Ground Runs

There are then the questions of *Climb*, *Take-off Run* and *Landing Run*. The former is sometimes given at sea level, sometimes at various heights, and often it is not clear from makers' catalogues whether the test climb was done with full load. The form the standardised climb should take is debatable, but I suggest that it will serve most interests if given in time taken to various altitudes (corrected, of course!) at full load and at full throttle in the first case, and at maximum permissible continuous revolutions as a second case. Furthermore, the airscrew used for the climb should always be the same as for all the other tests. The practice of changing the airscrew which is resorted to by some Continental manufacturers cannot too strongly be deprecated.

The *Take-off Run* and *Landing Run* should always be specified as applying with or without controllable-pitch airscrews and/or wheel brakes, and the type and state of the surface should be stated. The runs would be measured as distances and not as times taken, and full load would be carried.

The *Service Ceiling* is one of the few points upon which there is already any agreement, and the definition—the height at which the climb is only 100ft./min.—seems to work fairly well, although it might be better if something a little more easily determined in practice were agreed upon.

Percentage Error

The final point I ask for is an agreement as to the percentage error allowable on all the quoted figures. This might have to be varied with different types, and certainly for different performances, but there should be internationally agreed figures which would allow comparisons to be made.

These are only a few ideas on the subject, but it is a subject which needs the closest investigation, more so as every day the sales of aircraft increase. It would seem an excellent opportunity for the Society of British Aircraft Constructors to get something done in this country for a start. It would assist the sales of our aircraft a great deal, and, we hope, set a standard which other nations would follow.

Soaring in Derbyshire

The Derbyshire Gliding Club has obtained its long-desired lease of Bradwell Edge, Eyam, in the Peak District. Incidentally, the Manchester Gliding Club, which has been doing a great deal of towed glider work at Woodford, is to amalgamate with the Derbyshire Club, so we may see considerably increased activity in this part of the world. The two-seater and primary gliders at Woodford will be transferred to Bradwell Edge, and the increased membership should bring the club into the Air Ministry's subsidy scheme.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



The first D.H. "Rapide" to be delivered to British and Continental Airways, a new company which is to operate a daily service to the Continent. Two others are at present on order. For the moment, the Continental destination of the first service cannot be revealed, but Messrs. J. K. Morton and A. P. K. Hathersley have joined the Company as pilots. (Flight photograph.)

THE WEEK AT CROYDON

A Contrast in Size : Charter Pilots See Life : Canine Controversy : Nocturnal Joy-riding

THE week's most interesting event had not to do with the departure of some night-flying 30-40-seater aeroplane, in the cosily-illuminated saloons of which deft-handed stewards were preparing to serve a four-course dinner and choice wines while flying high above the Channel. That sort of thing is no longer news; what thrilled Croydon last week was the exploit of Mr. Robert Kronfeld, the gliding expert, who, in his little 600 c.c. Douglas-engined "Drone," with six gallons of petrol, flew from Croydon to Le Bourget in just over four hours. The six gallons of petrol were enough for a flight of 360 miles, said Mr. Kronfeld. By contrast, our big aeroplanes usually set off with something like five or six hundred gallons.

Capt. Walters, of Imperial Airways, who has been flying on Empire routes for some time, has returned from Cairo. He is to be replaced by Capt. Horsey. Most of the senior Imperial pilots take a turn from time to time on some section of Empire routes. Air France, I believe, has special pilots who remain permanently on the long-distance lines, whereas K.L.M. pilots fly regularly four times a year or more to Batavia and back, and fly the rest of the time in Europe.

Air taxi pilots seem to see all the fun of the fair, especially, perhaps, Mr. "Bill" Ledlie, of Olley Air Service. Not long ago he did a trip to St. Andrews, where part of his duty was to play golf every day for a week with his clients. The other day he returned from an extensive continental tour with his pockets full of the assorted small change of half the countries in Europe besides a handsome collection of casino "chips." He had gambled—successfully, I believe—at Cannes, Juan-les-Pins and Monte Carlo, all on the same day!

During recent discussions about the illegal importation of dogs by air at Croydon the question arose whether certain animals were landed in the County or in the Borough. The answer, which confused the enquiring officials, was that from an aviation point of view the dogs were landed in the County,

but from the Customs standpoint they were landed (or disembarked) in the Borough. Practically the whole landing area lies in the County, but the tarmac and terminal buildings are in the Borough.

I rather think I owe the Air Ministry an apology for saying the hot-water pipes were cut off automatically in accordance with some silly regulation on May 1. They were cut off on or about that date in connection with the structural alterations now in full swing which, when completed, will allow passengers' passports to be examined before their luggage. The authorities, it seems, are now grimly determined to finish this job at all costs in time for the slack season for passenger traffic, which means that we shall reap the benefit of their labours in the summer of 1936.

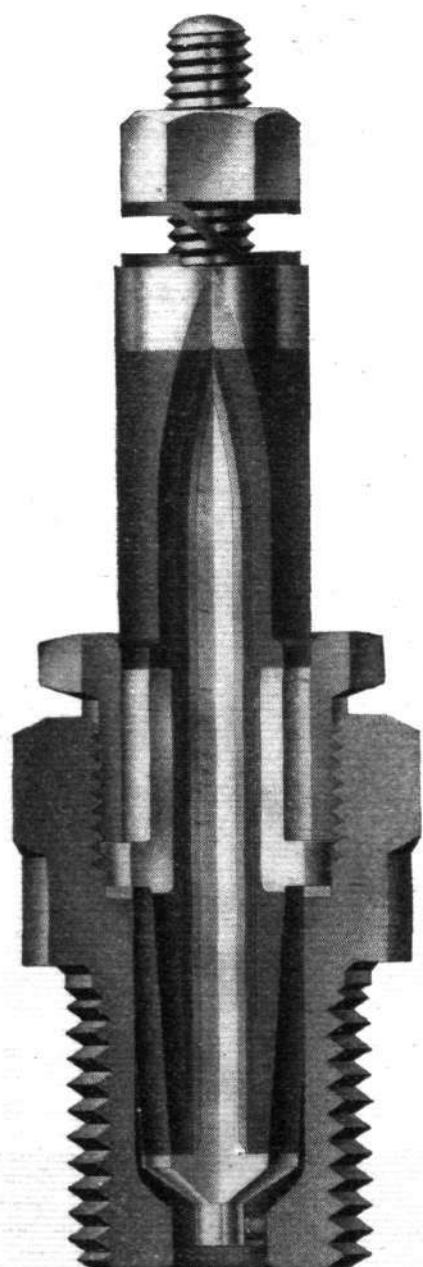
A number of ex-Banco people have been seen at Croydon lately, and several of them have joined the staff of that growing concern Olley Air Service. Among them are Lord Amherst, Mr. Morten and Mr. Miller, the former two being pilots and the latter from the Banco traffic staff.

Somebody writing in a leading newspaper complained bitterly of aeroplanes flying over London at night. Most of the machines complained of carried people who wanted to see the Jubilee illuminations, and the majority were probably Londoners. The letter-writer somewhat optimistically remarked "Now that summer is here people desire to sit on balconies—even on roofs." Other people, however, desire (more logically, perhaps) to sit in the warm cabins of aeroplanes and look down with a smile on London rather than to sit on an iced roof and look up with a scowl. Is there any reason why one gentleman, even though his letter is dated from the House of Commons, should be allowed to put a stop to what is becoming a flourishing business to air companies and a source of genuine enjoyment to very many people? Provided always, of course, that aeroplanes over London keep to a safe height and obey the regulations

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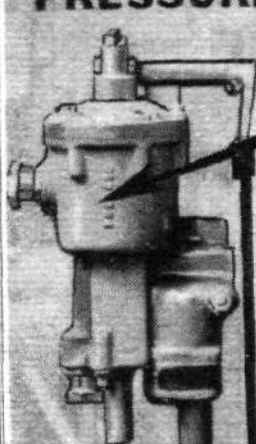
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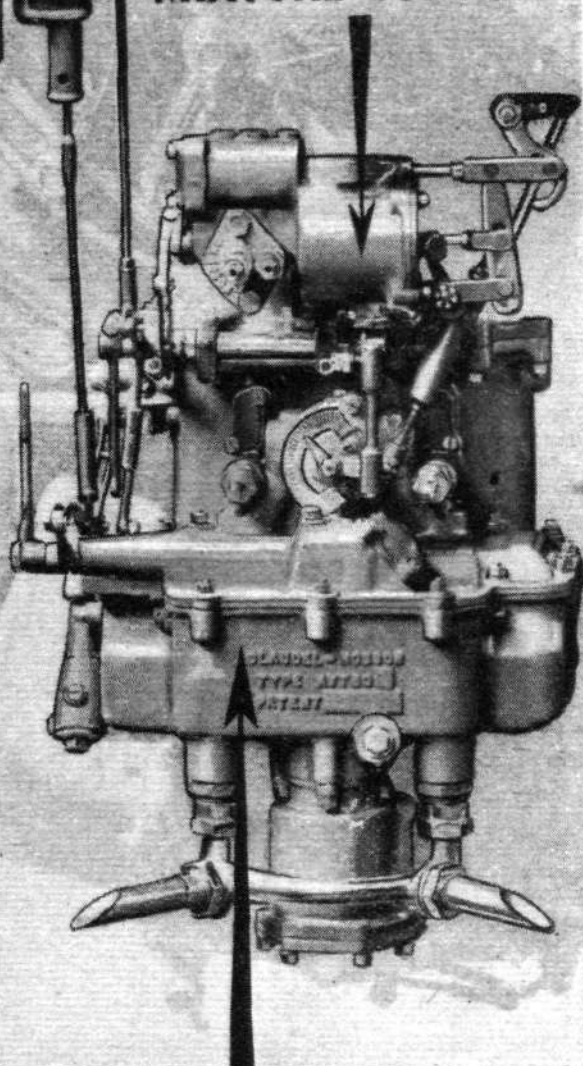
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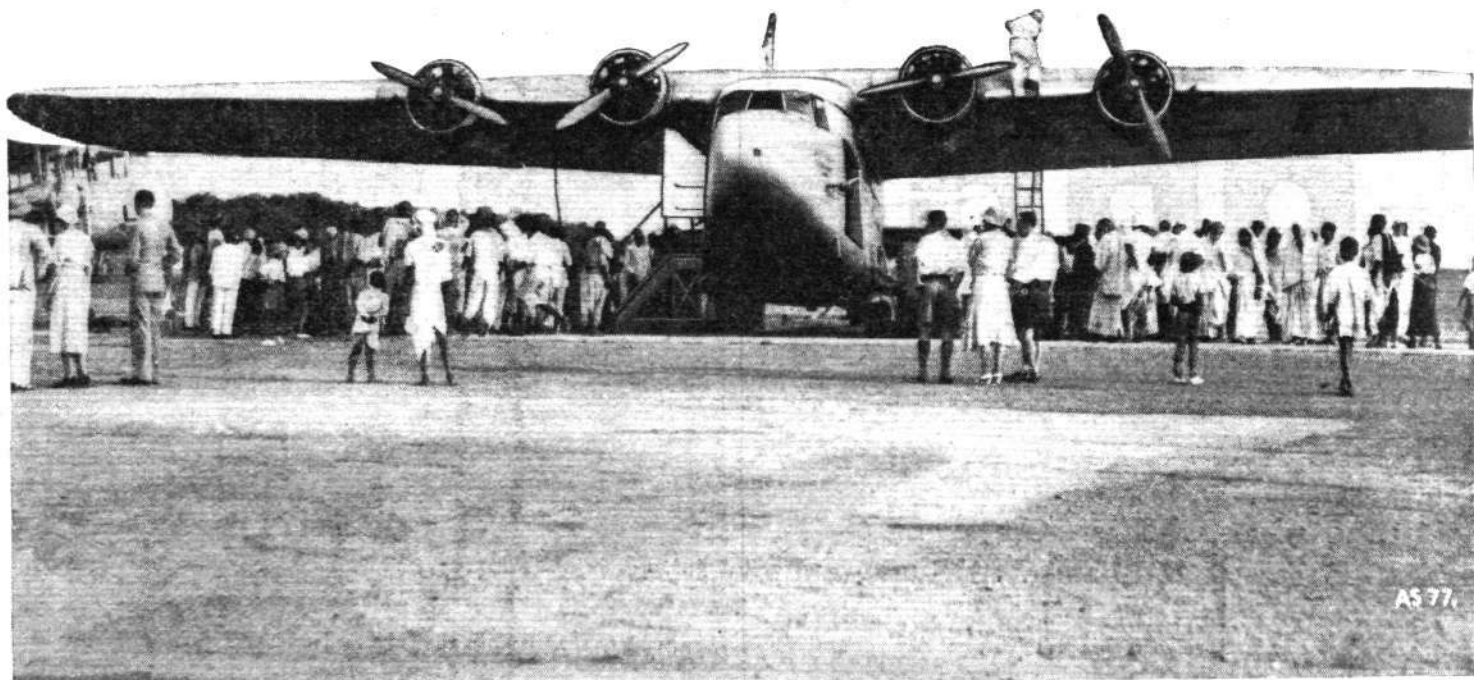
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Developments in the West

Mr. R. T. Boyd, who operated a summer service from Barnstaple to Lundy Island last summer with a Monospar, has bought a Short "Scion." His concern is now known as Atlantic Coast Air Services, and daily excursion services are run to Lundy as well as services on Monday, Wednesday and Saturday to Cardiff, where connections to Bristol, Bournemouth and Guernsey can be made. A new service to Plymouth will be opened shortly. Mr. Boyd, of course, operates from Heanton Court aerodrome.

From the City

Maddox Airways, the charter firm whose projected activities were reviewed in *Flight* last year, are now operating a D.H. "Dragon," a "Leopard Moth," a Miles "Falcon," and a "Hawk Major," all of which are housed and maintained at Brooklands. Mr. S. Fine, previously a pilot with Birkett Air Services, has joined Messrs. Midgley and Ross.

Since the middle of March Maddox Airways have flown some 14,500 miles, and business is coming in very satisfactorily. On Jubilee Day alone seven machines were in use. Their office address is 37, Gracechurch Street.

To the Western Isles

Later this year the Blackpool and West Coast line between the Isle of Man and Belfast will be extended to Campbeltown.

Meanwhile Mr. Glyn Roberts, who operates West of Scotland Air Services, a charter concern, is considering a daily service between Glasgow and Arran. Shiskane will probably be the landing ground there, and Mr. Roberts hopes to use a Short "Scion" for the service. The "Scion," incidentally, is coming into its own for small capacity work or for work on new and untried routes.

Northern and Scottish Airways will duplicate their Islay service after June 1 in order to cope with the Golf Championship traffic.

Edinburgh on the Map

Now that the Edinburgh Corporation have, at the last minute, buttonholed the site at Gilmerton there is a strong chance that North-Eastern Airways will shortly be able to reach Edinburgh with their service. The municipal aerodrome, of course, cannot in any case be ready until next year, but the Air Ministry definitely promised the use of Turnhouse when and if the civil authorities made some sort of move—and the move appears to have been made. Presumably, Aberdeen Airways will also be able to make use of this aerodrome when their London-Aberdeen service is opened.

North-Eastern Airways are not yet carrying profitable loads, but the average number of passengers is increasing slightly but firmly, and there is every reason to believe that, when the service is known and has proved its reliability, business will be good. The appearance of Edinburgh on the map should make a considerable difference.

Essex Expectations

Work on the ground at Essex Airport is still going ahead, and the incoming pilot, unused to the lie of the land, finds the many ground signs difficult to follow. The centre patch will, however, soon be finished, and the removal of one or two odd trees on the southern boundary will ease matters for the pilot coming in from that direction—particularly since the ground slopes perceptibly down to the terminal buildings. Experiments, too, are still being made with different types of boundary beacons, but there is no doubt that next winter will see complete night landing equipment at Stapleford.

One hears that Hillmans have at last received permission to use short-range direction-finding equipment. Stapleford is difficult to locate in thick weather, and such a device will be a considerable help to the pilots. Croydon and Heston will, of course, continue to provide the general guidance to Continental and north-bound machines respectively. The pilots will be glad to have radio operators in the 86s when these arrive. At present one Paris machine carries an operator, and works on W/T.

Since Capt. Stack's arrival the administration buildings and workshops have been noticeably tidied up, and everyone on the staff is now in uniform. Capt. Stack, incidentally, sometimes delights the populace with the help of a "Moth" on Sunday mornings.

There appears to be no doubt that the projected Brussels service will materialise, and the knowledge that Hillman's are to co-operate with at least one other operator has given rise to some interesting rumours. Gatwick has been suggested as a possible scene of new operations and one of our oldest internal services as a co-operative. We shall see.

Radio at Hull

The mobile radio station at Hull (Hedon) was put into action again on May 1, and machines flying east of the Pennines can now make use of this station. Its wavelengths are 862 metres and 900 metres. Primarily for the K.L.M. service, the station should be of inestimable value to Provincial Airways and to Aberdeen Airways when their southern service is opened. The latter company, incidentally, is having Standard sets installed in its machines.

Feeding the Midlands

On May 27 Railway Air Services will open their summer service between the Midlands, Cardiff, Torquay (Denbury), and Plymouth. Two runs will be made each way daily, and the route, as already foreshadowed in *Flight*, now starts from the Midlands at Nottingham, and, of course, includes Birmingham (Castle Bromwich) as before.

On the same date a twice daily service will be reopened from Liverpool, via Birmingham and Bristol to Southampton, with the expected extension to Portsmouth and Brighton. Presumably the new aerodrome will be used at this end, though the buildings have not yet been completed. From Southampton a shuttle service will be run to Cowes and Sandown.

A glance at the map published in the issue of May 2 will indicate the enormous number of new connections which are made possible by these reopened and extended services. R.A.S., incidentally, have recently purchased four "Dragons" to supplement their fleet. It is interesting to remember that the Birmingham-Plymouth service was the first railway service to be operated—by the G.W.R.

A Super Freighter

Mr. John Pugh, of Commercial Air Hire, is hoping shortly to take delivery of a specially equipped Avro 642 (two Siddeley "Jaguars") which he will use primarily for his newspaper service. Given a certain minimum payload this machine should be ideal for the work, as it is both fast and economical when its payload is considered. With two "Jaguars" the cruising speed is 138 m.p.h. and the disposable load is 4,400 lb. This machine will replace the "Cruiser" which was lost in the Channel a fortnight ago and will be superlatively equipped, particular attention being paid to the pilot's and co-pilot's comfort. For the moment the various very special features of the equipment cannot be enumerated.

Three Monospars are on order for Inner Circle Air Lines, and when these are delivered the Outer Circle will probably be opened. Mr. A. P. K. Hattersley, incidentally, has left the firm to be chief pilot to British Continental Airways, a new company and last week he spent a few hours discovering the differences between a "Dragon" and a "Rapide"—the first to be purchased by the new concern.

A Name to Live Up to

During the past few months the remains of the firm of Wrightson and Pearce have, in effect, been reorganising under the title of Wrightways, Ltd., and since the end of April have been carrying the morning newspapers over to Paris in a "Dragon," a contract having been signed with W. Dawson and Sons.

Although the new firm will probably be better known as air transport contractors, one of the "Disposals" hangars has been very thoroughly laid out for all forms of maintenance work. Machines and engines of all types can be handled by the staff, under the guidance of Mr. W. W. Warner, and the firm carries a very complete stock of spares in a bonded store. Welding and spraying can, of course, be done, and the whole shop gives one an impression of neatness and efficiency.

The directors of Wrightways are the Hon. John D. Kemp, Mr. G. P. McGivney and Mr. J. W. Duggan, who is also chief pilot, the last two having come over from Wrightson and Pearce. Mr. McGivney has been largely responsible for the new organisation.

At present the fleet consists of two "Dragons." One of these was recently purchased from the now defunct Banco concern—who, it is rumoured, have disposed of their Fords to one of the New Zealand operating companies. Both machines carry Plessey radio and Mr. J. Walker is the operator consistently carried on the early morning freight service. Wrightways, Ltd., also have the use of the fleet of Air Hire, Ltd., an associated undertaking.

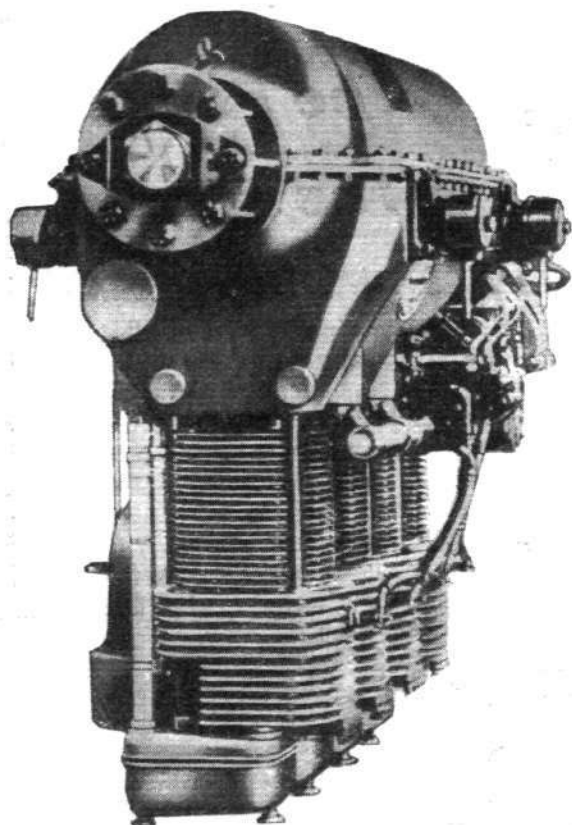
A week or so ago, Mr. S. L. Turner, who will be remembered chiefly as Capt. Stack's partner in the unlucky MacRobertson "Viceroy," joined the firm as assistant pilot. He has already flown the newspapers on one or two occasions, and the firm will also have the use of his "Gull" when this has been collected from North Africa.



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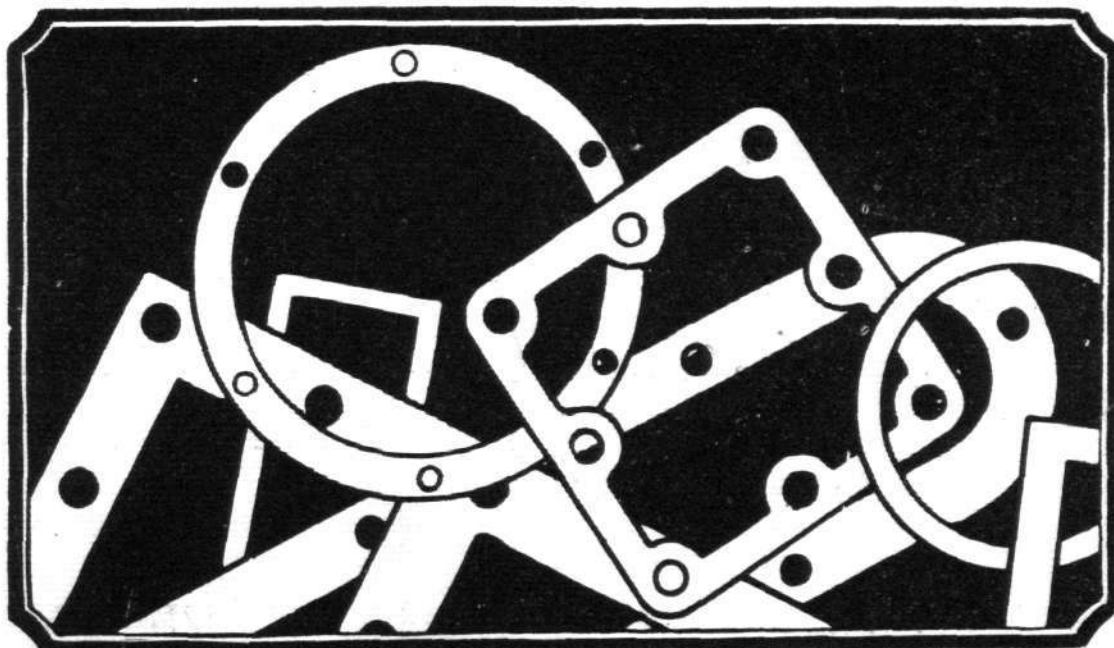
As a result of the test the oil is approved for use in Gipsy One, Two, Three, Major and Six engines for use in the normal category.

Details of the test are given on attached sheet, Test Report No. EE.281.

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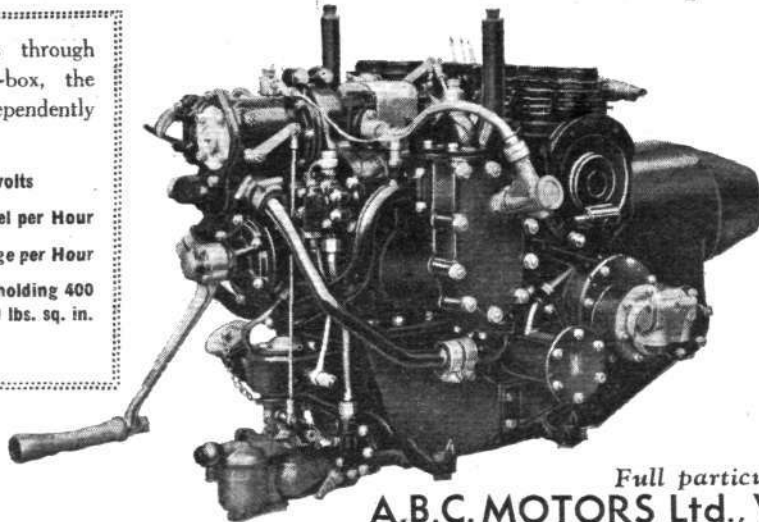
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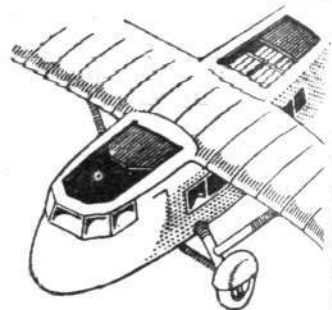
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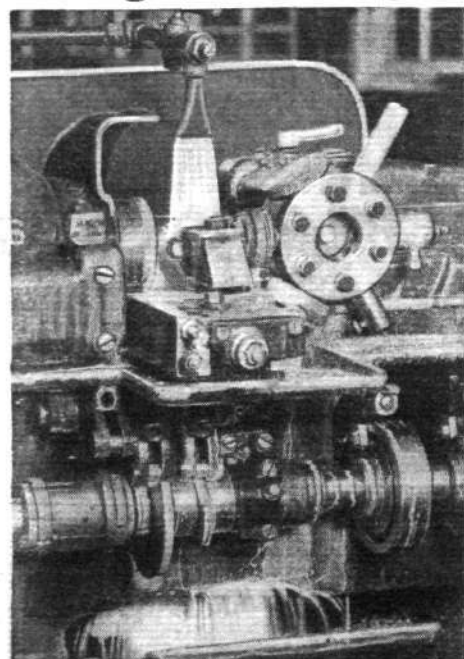
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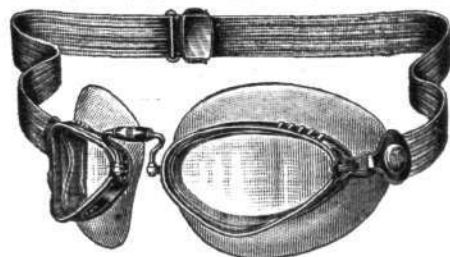
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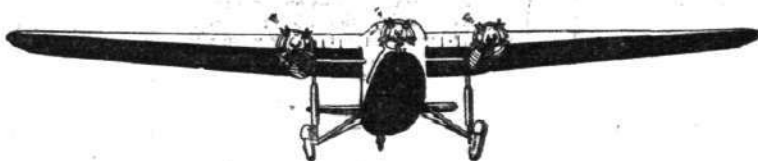
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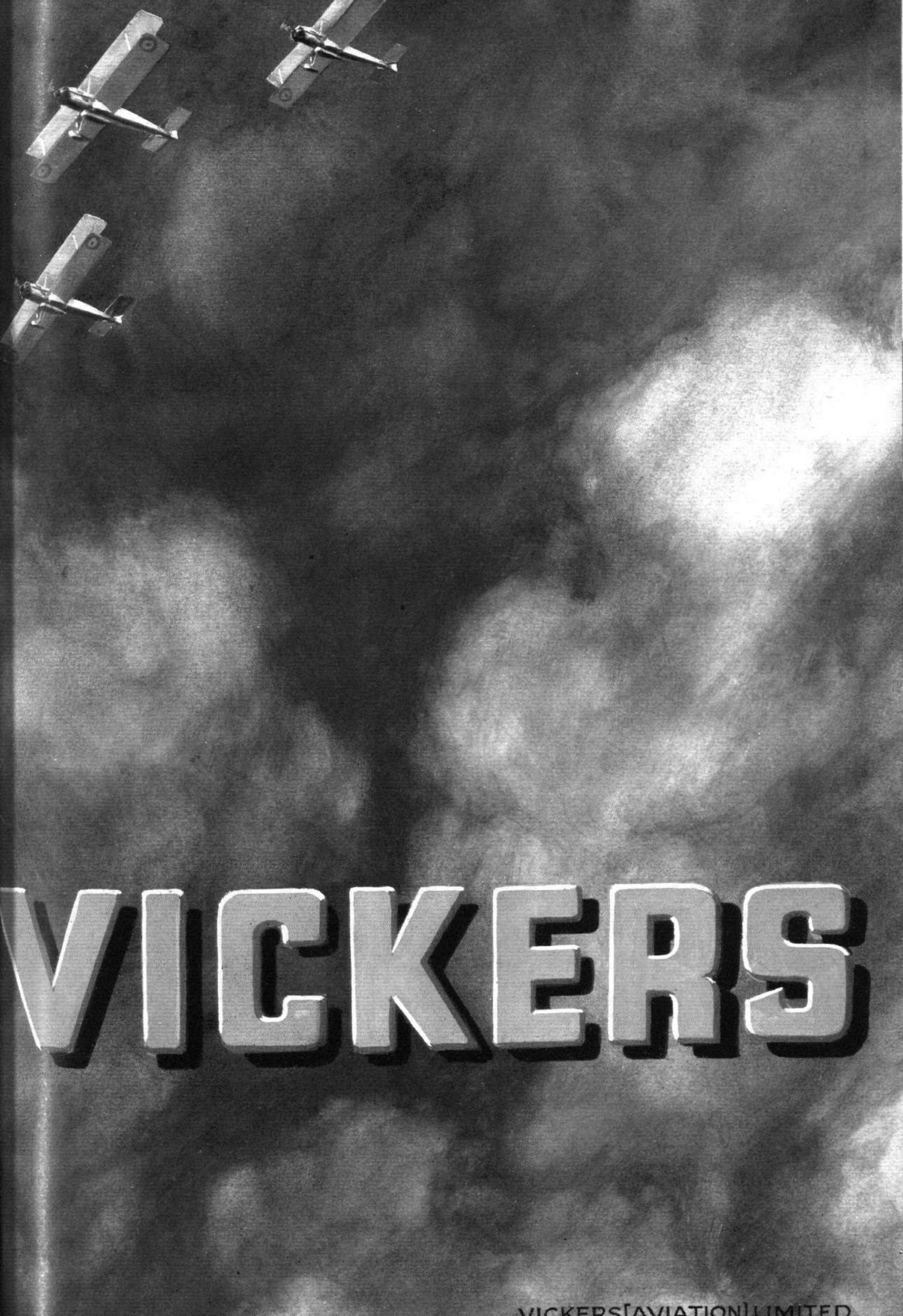


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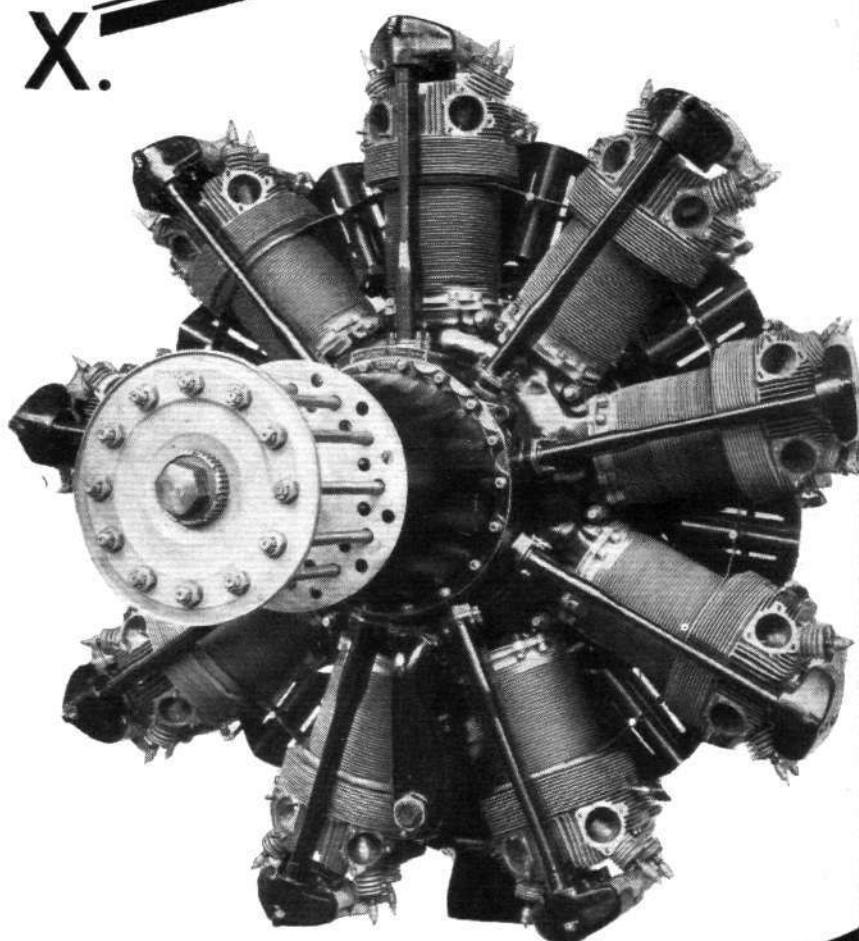


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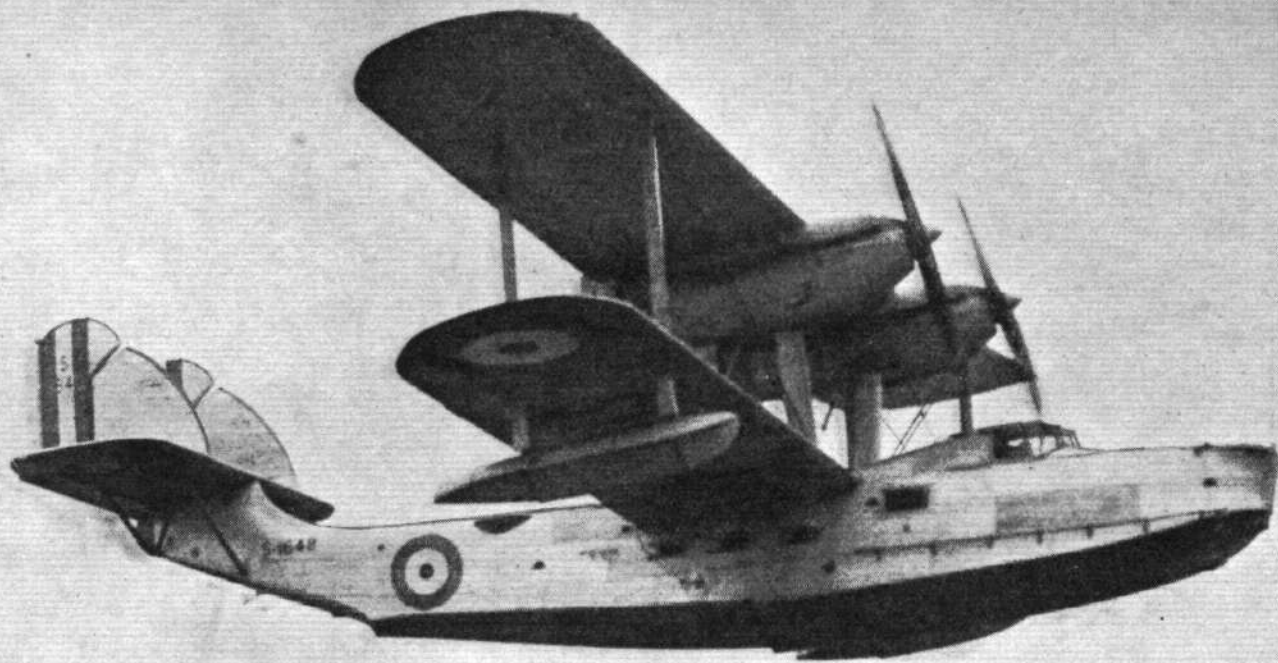
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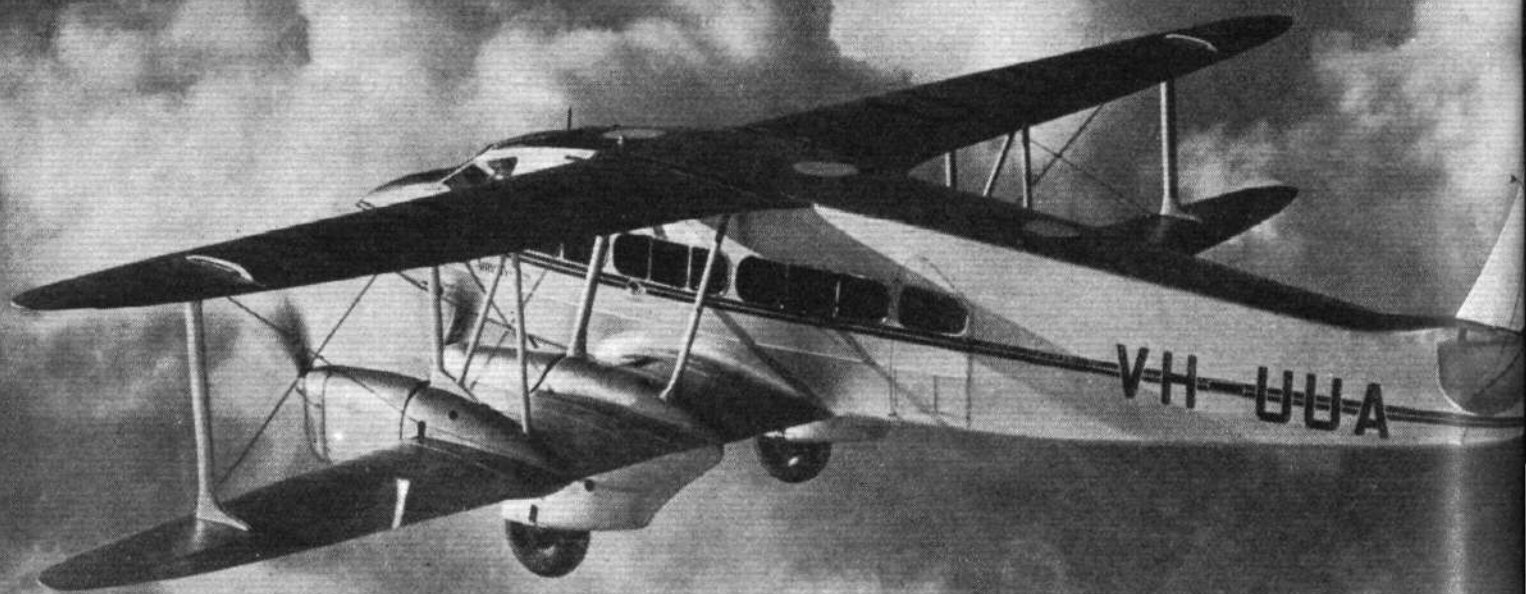
Typical British Military and Civil Machines in Service To-day : A Pictorial Record

THIS year is a fitting occasion for retrospection, but there is no merit in looking backwards unless one also looks forward. History, it has been said, is the politics of the past: the politics of to-day make what the future will call history. It is foolish to look back for the purpose of jeering at the ignorance of bygone days and patting ourselves on the back for having reached such a climax of virtue and cleverness. The year 1935 will some day be as out of date as 1910 now appears, in spite of the amazing capabilities of aeroplanes as we now know them.

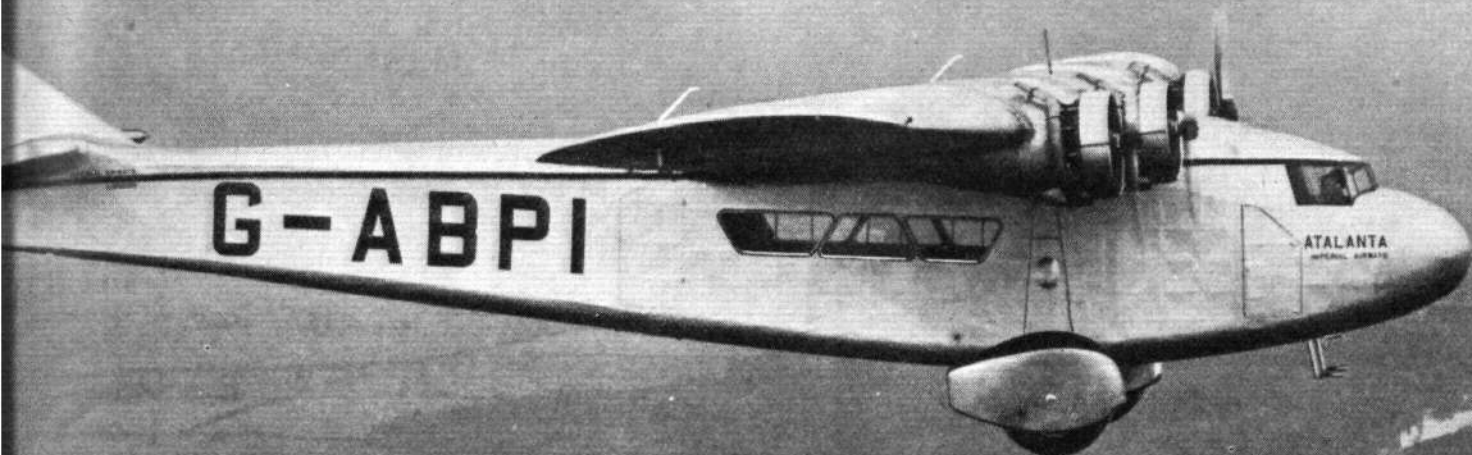
Nevertheless, a pictorial record of the leading aircraft of the present day will form a souvenir worth preserving; of the types shown in the following illustrations (which are copyright *Flight* photographs) some are civil machines, and some standard R.A.F. types. No attempt has been made to give preference to either class. The aim has been to present typical examples in use to-day for a wide variety of purposes. Again, for those among the newer readers of *Flight* who are not expert at recognising aeroplanes at sight, the pages that follow will form a valuable guide to the types which will be seen next Saturday, May 25 (Empire Air Day), at the Royal Air Force Display at Hendon on June 29, at the Royal Review at Duxford on July 6, and at other important events in the aeronautical world.



"SCAPA"



D.H. 86.



"OVERSTRAND"

SUPERMARINE "SCAPA"

TYPE: Reconnaissance Flying Boat.
 ENGINES: Two 525 h.p. Rolls-Royce
 "Kestrel III" water-cooled 12-cyl. vee,
 supercharged.
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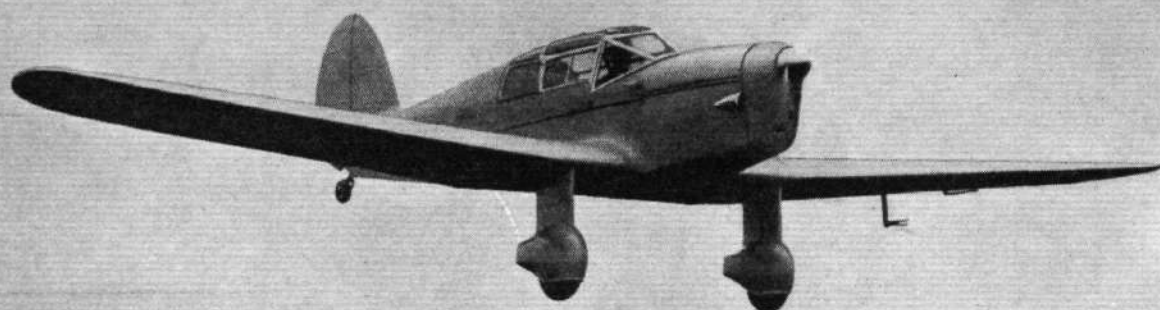
TYPE: Four-engine High-Speed Com-
 mercial Biplane.
 ENGINES: Four 200 h.p. "Gipsy Six"
 air-cooled 6-cyl. inverted "in-line."
 MAX. SPEED: 170 m.p.h. at 1,000 ft.
 LENGTH: 43' 11"; SPAN: 64' 6". Widely
 used on internal and Colonial air lines.

ARMSTRONG-WHITWORTH "ATALANTA"

TYPE: Four-engine Commercial Mono-
 plane.
 ENGINES: Four 340 h.p. Siddeley "Ser-
 val" air-cooled 10-cyl. geared radial.
 MAX. SPEED: 156 m.p.h. at 3,000 ft.
 LENGTH: 71' 6"; SPAN: 90'. Used
 on Imperial Airways Empire routes.

BOULTON PAUL "OVERSTRAND"

TYPE: Twin-engined "Medium" Bomber.
 ENGINES: Two 580 h.p. Bristol "Pegasus"
 air-cooled 9-cyl. geared radials, super-
 charged.
 MAX. SPEED: 152 m.p.h. at 5,000 ft.
 LENGTH: 41'; SPAN: 72'. Now going
 into service with Royal Air Force.

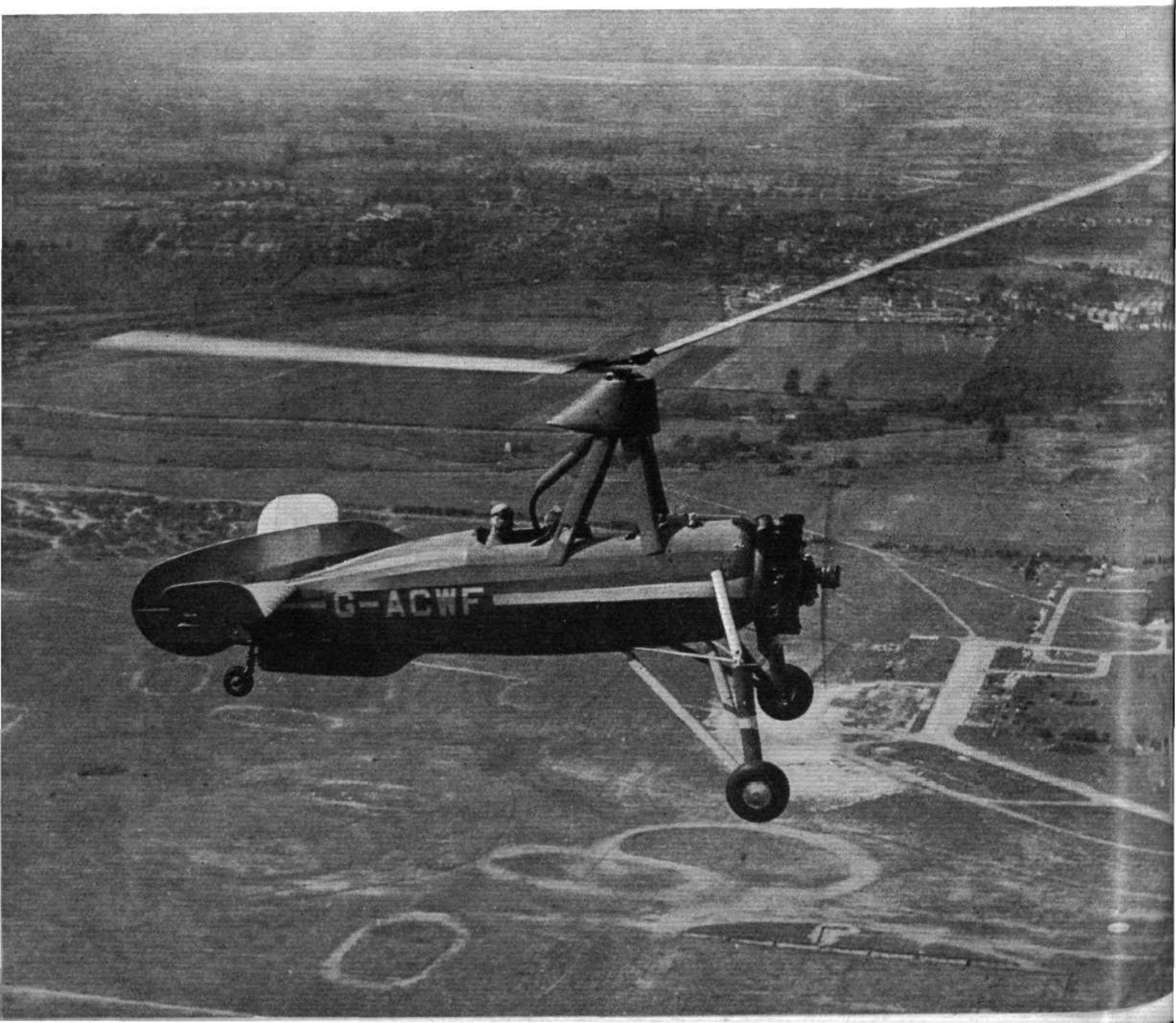


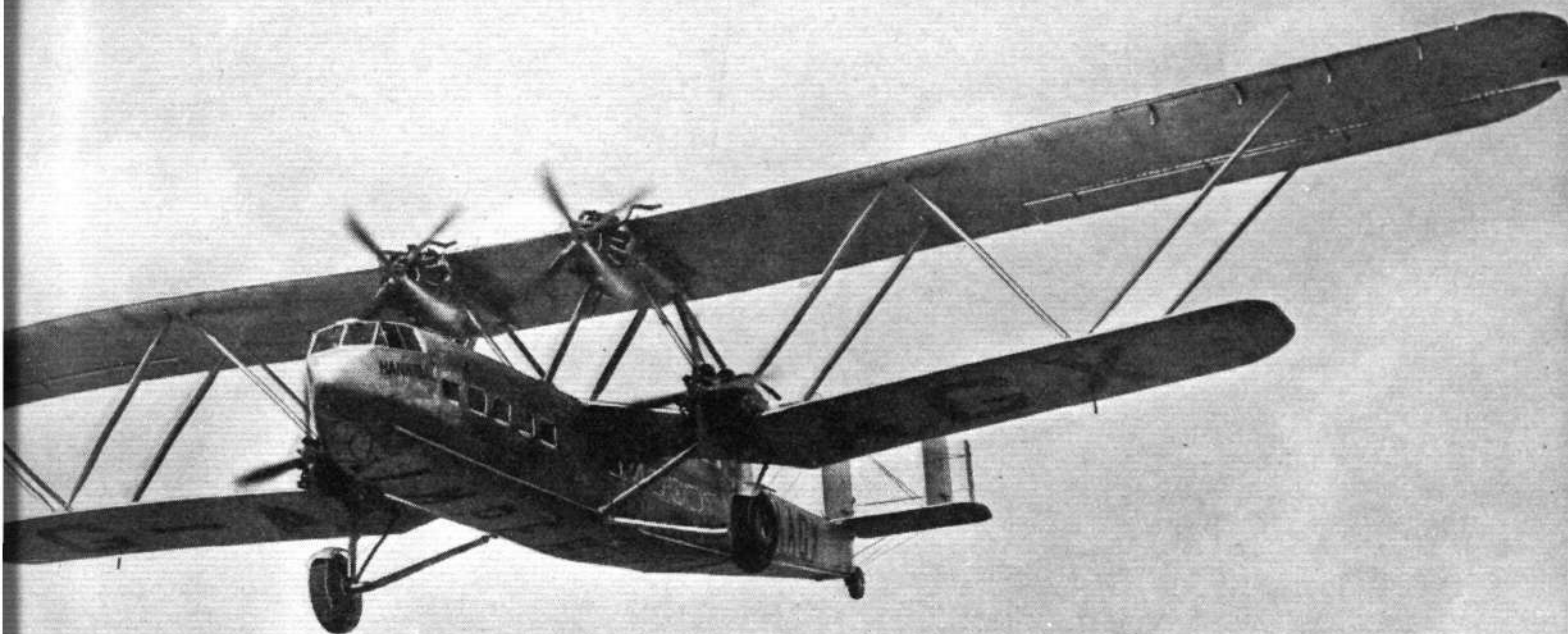
PERCIVAL "GULL"

TYPE: Three-seater Cabin Monoplane. LENGTH: 24' 11"; SPAN: 36' 2".
 ENGINE: 200 h.p. "Gipsy Six" air-cooled 6-cyl. inverted "in-line." Available with "Gipsy Major" or "Javelin" engine. Suitable for private-owner or taxi work.
 MAX. SPEED: 172 m.p.h. at sea level.

AUTOGIRO C.30

TYPE: Two-seater Direct-Control Autogiro. MAX. SPEED: 112 m.p.h. at sea level.
 ENGINE: 140 h.p. Siddeley "Genet Major" air-cooled 7-cyl. direct-drive radial. LENGTH: 19' 8½"; ROTOR DIAM.: 37'.
 Adopted for civil, military and naval use.

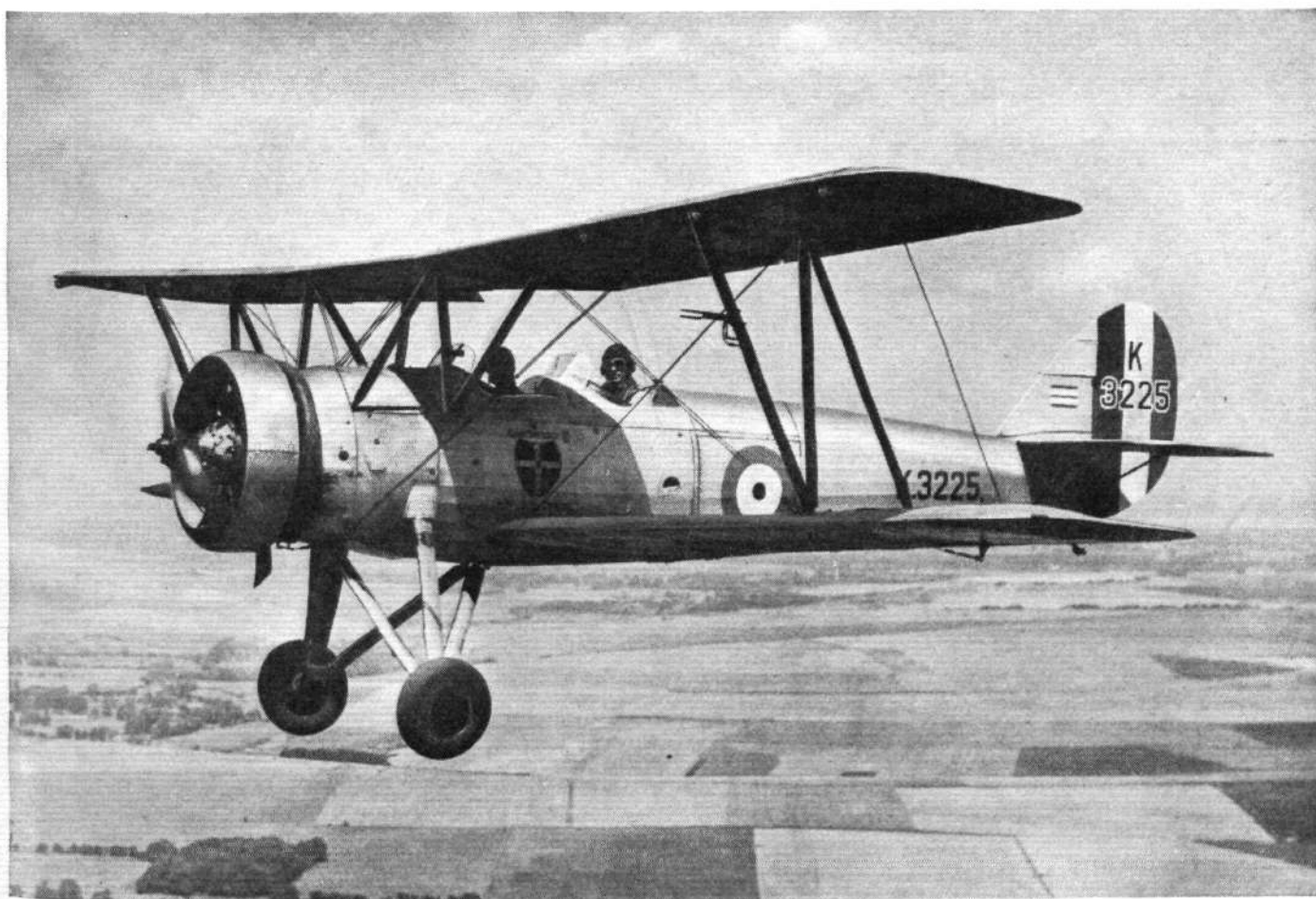




TYPE: Four-engined Air Liner.
 ENGINES: Four 555 h.p. Bristol "Jupiter X.FBM" air-cooled 9-cyl. geared radials, supercharged.

HANDLEY PAGE "HANNIBAL"

MAX. SPEED: 127 m.p.h. at 4,000 ft.
 LENGTH: 89' 9"; SPAN: 130'. Extensively employed by Imperial Airways.



TYPE: Dual-control Training Biplane.
 ENGINE: 215 h.p. Siddeley "Puma IV" air-cooled 7-cyl. direct-drive radial.

AVRO "TUTOR"

MAXIMUM SPEED: 122 m.p.h. at sea level.
 LENGTH: 26' 6"; SPAN: 34'. Standard training machine of Royal Air Force.

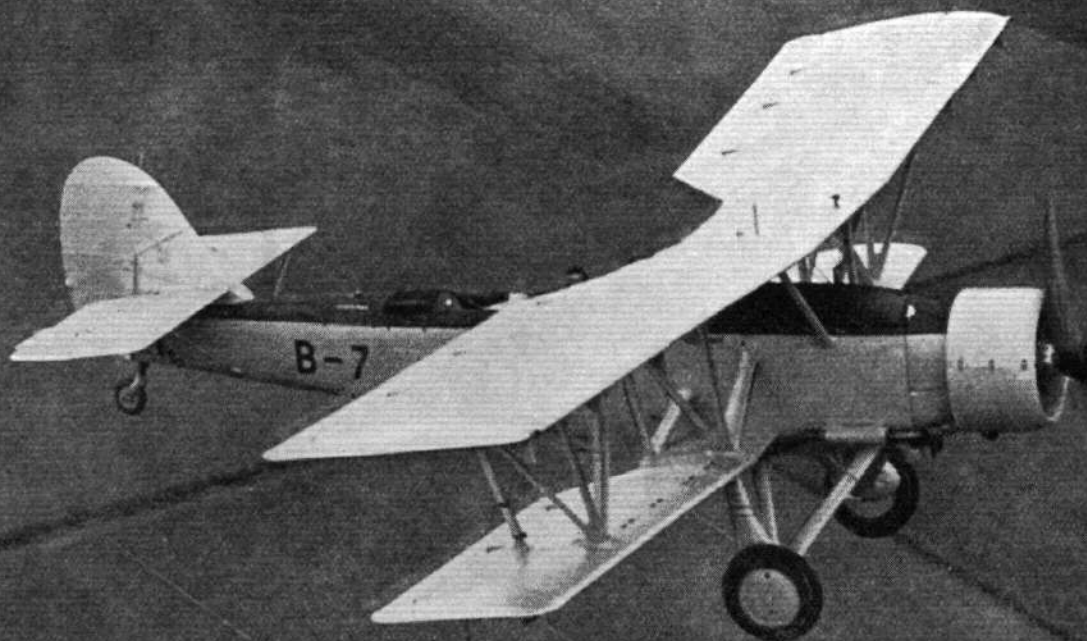


SHORT "SCION"

TYPE: Six-seater Transport Monoplane. MAX. SPEED: 128 m.p.h. at 1,000 ft.
ENGINES: Two 90 h.p. Pobjoy "Niagara" air-cooled 7-cyl. geared radial. LENGTH: 31' 6"; SPAN: 42'. Suitable for "feeder lines" or private ownership.

BLACKBURN "G.P."

TYPE: Two-seater General Purpose. PERFORMANCE figures not available.
ENGINE: 725 h.p. Siddeley "Tiger IV" air-cooled 14-cyl. geared radial. LENGTH: 35' 2"; SPAN: 46'. Similar to "Shark" used by Fleet Air Arm.





HAWKER "HART"

TYPE: Two-seater Light Bomber.

ENGINE: 600 h.p. Rolls-Royce "Kestrel VI" water-cooled 12-cyl. vee, supercharged.

MAX. SPEED: 200 m.p.h. at 14,000 ft.

LENGTH: 29' 4"; SPAN: 37' 3". Basic design for several variations used by R.A.F.

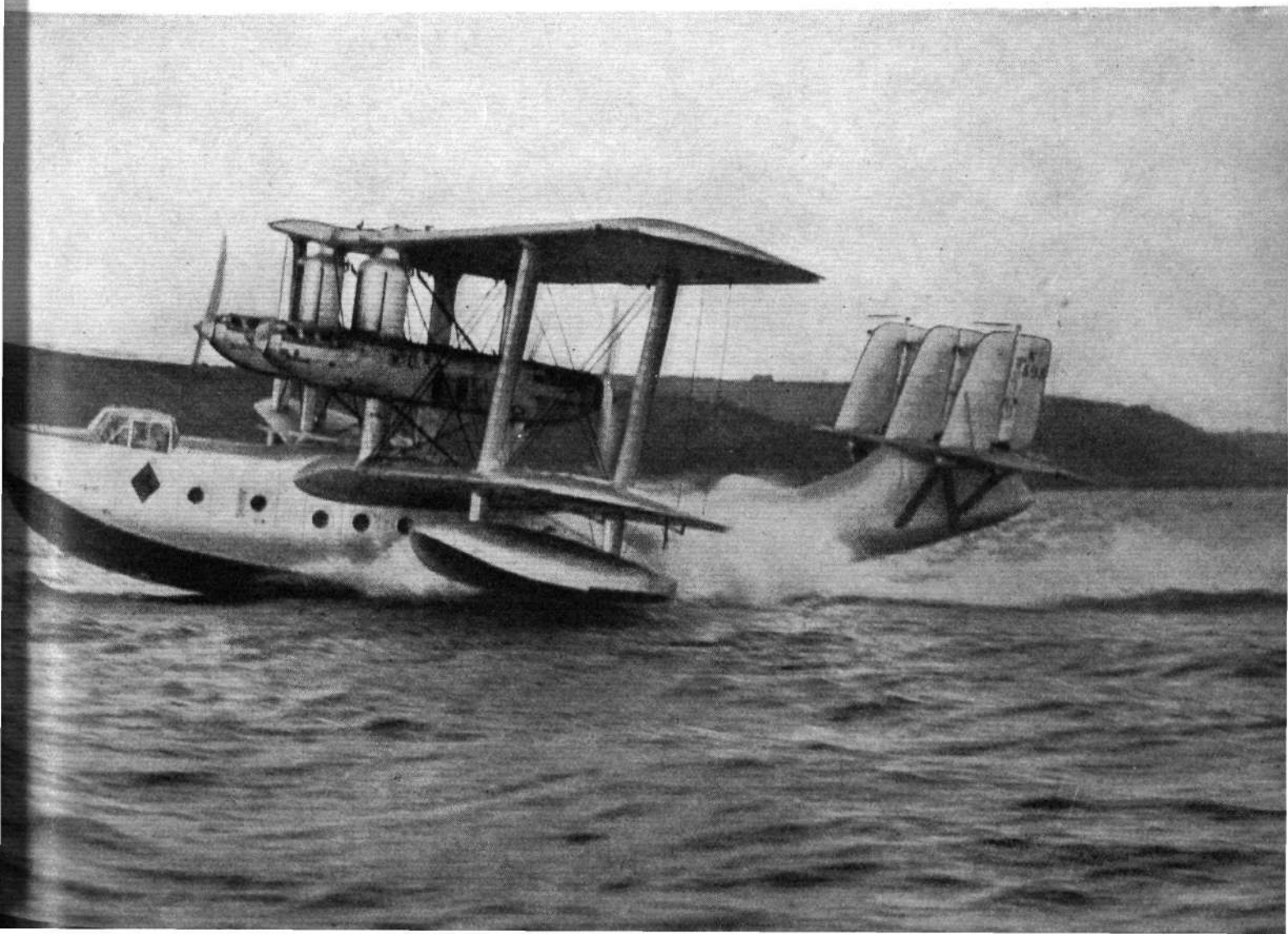
SHORT "SINGAPORE III"

TYPE: Reconnaissance Flying Boat.

ENGINES: Four 560 h.p. Rolls-Royce "Kestrel" water-cooled 12-cyl. vee, geared.

MAX. SPEED: 145 m.p.h. at 2,000 ft.

LENGTH: 64' 2"; SPAN: 90'. A standard type used by the Royal Air Force.

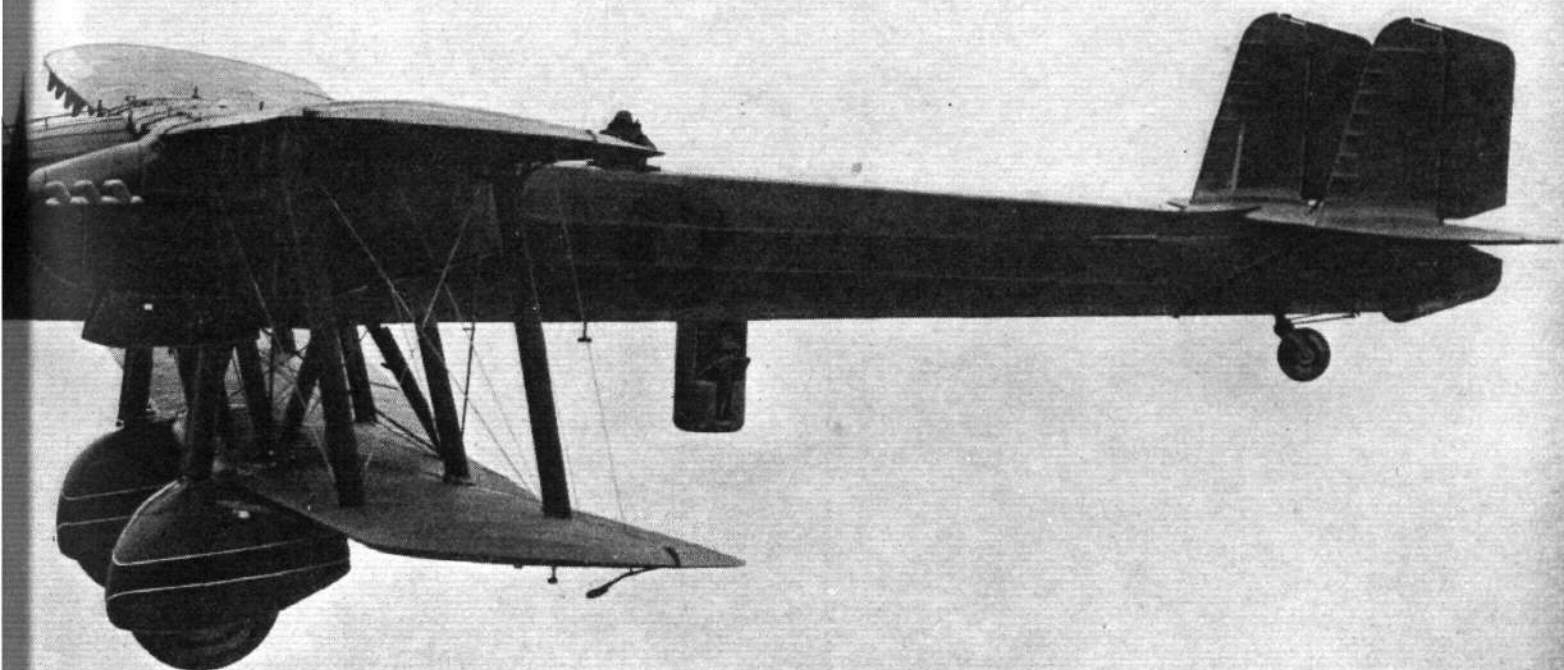




"FURY"



"HENDON"



"HEYFORD"



F. 7/30

HAWKER "FURY"

TYPE : Single-seater Interceptor Fighter.
ENGINE : 600 h.p. Rolls-Royce "Kestrel VI" water-cooled 12-cyl. vee, supercharged.
MAX. SPEED : Approx. 240 m.p.h.
LENGTH : 26' 8"; SPAN : 30'. Standard interceptor fighter of Royal Air Force.

FAIREY "HENDON"

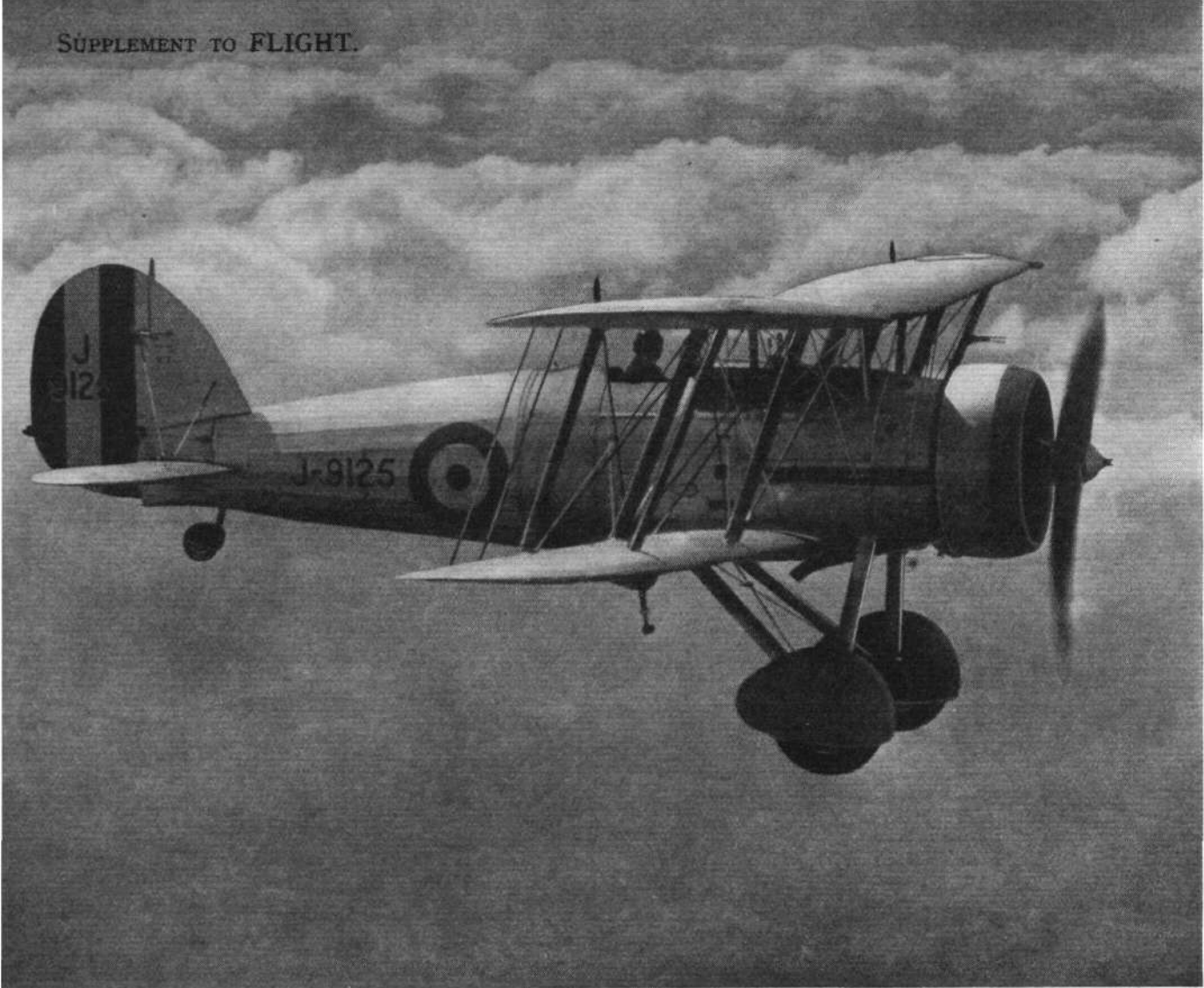
TYPE : Long-range Heavy Bomber.
ENGINES : Two 600 h.p. Rolls-Royce "Kestrel" liquid-cooled 12-cyl. vee, supercharged.
Performance figures not available.
LENGTH : 69' 6"; SPAN : 100'. Now in quantity production for Royal Air Force.

HANDLEY PAGE "HEYFORD"

TYPE : Twin-engine Heavy Bomber.
ENGINES : Two 525 h.p. Rolls-Royce "Kestrel" water-cooled 12-cyl. vee, supercharged.
MAX. SPEED : 142 m.p.h. at 13,000 ft.
LENGTH : 58'; SPAN : 75'. Equipment of several squadrons of Royal Air Force

WESTLAND F.7/30

TYPE : Single-seater Day and Night Fighter.
ENGINE : 660 h.p. Rolls-Royce "Goshawk" steam-cooled 12-cyl. vee, geared, supercharged.
Performance figures and dimensions not available. Engine mounted behind pilot, airscrew driven by shaft.



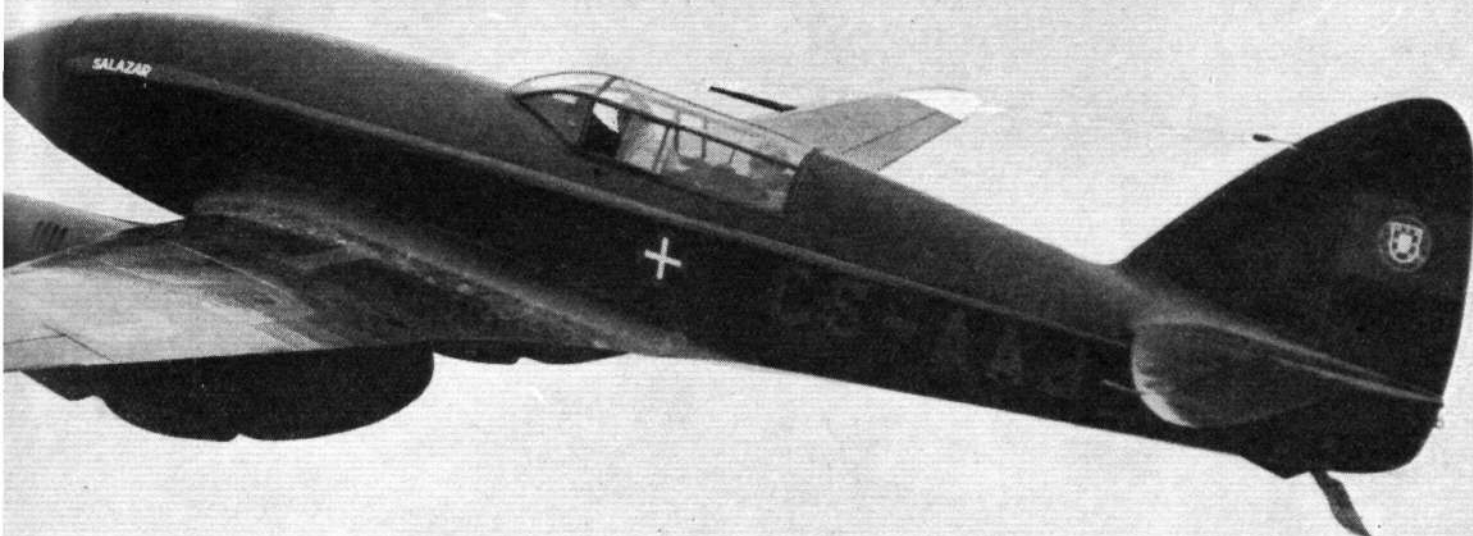
GLOSTER "GAUNTLET"

TYPE: Single-seater Day and Night Fighter.
ENGINE: 600 h.p. Bristol "Mercury" VI.S
air-cooled 9-cyl. geared radial, super-
charged.
MAX. SPEED: 230 m.p.h. at 15,800 ft.
LENGTH: 26' 2"; SPAN: 32' 10". This
type is now being issued to several squadrons.

HENDY "HECK"

TYPE: Two-seater Cabin Monoplane.
ENGINE: 200 h.p. "Gipsy Six" air-cooled
6-cyl. inverted "in-line."
MAX. SPEED: 182 m.p.h. at sea level.
LENGTH: 26' 2"; SPAN: 31' 6". One
of the fastest civil machines in Great
Britain.





D.H. "COMET"

TYPE: *Two-seater Racing Monoplane.*
 ENGINES: *Two 224 h.p. D.H. "Gipsy Six R" air-cooled 6-cyl. inverted "in-line."*

MAX. SPEED: *235 m.p.h. at 1,000 ft.*
 LENGTH: *29'*; SPAN: *44'*. *Winner of England-Australia Race, 1934.*

MONOSPAR S.T.12

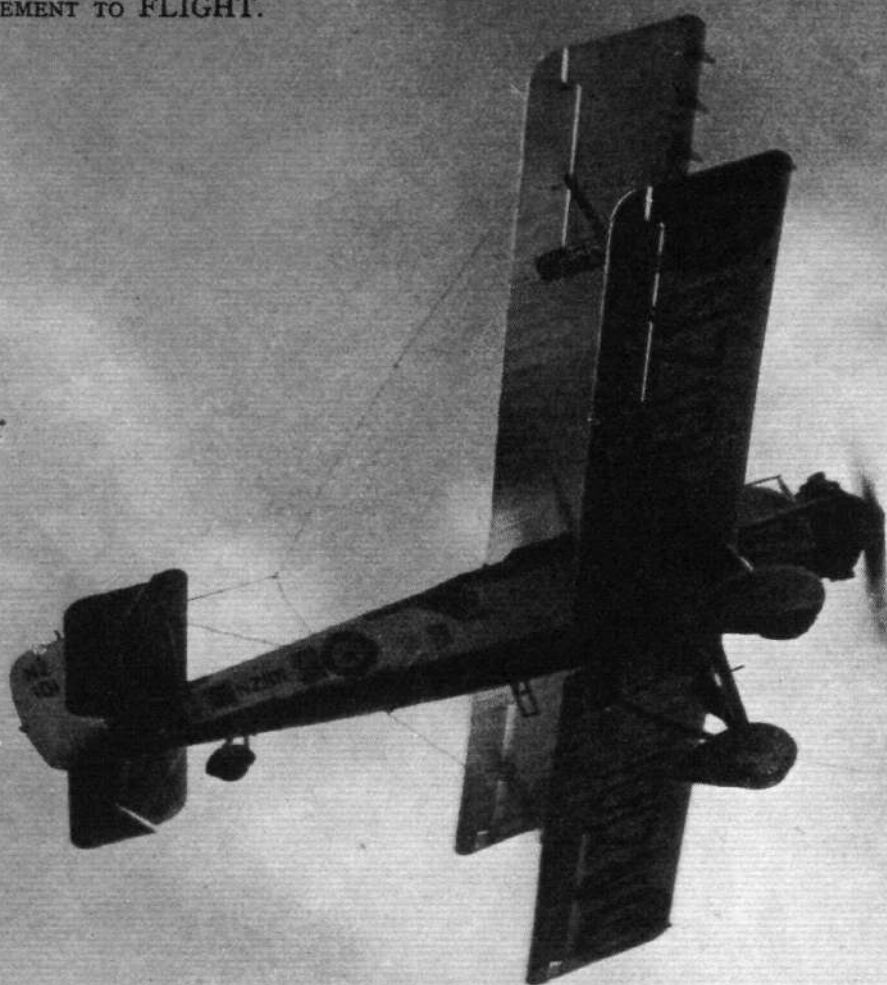
TYPE: *Twin-engined Four-seater Monoplane.*

ENGINES: *Two 130 h.p. D.H. "Gipsy Major" air-cooled 4-cyl. inverted "in-line."*

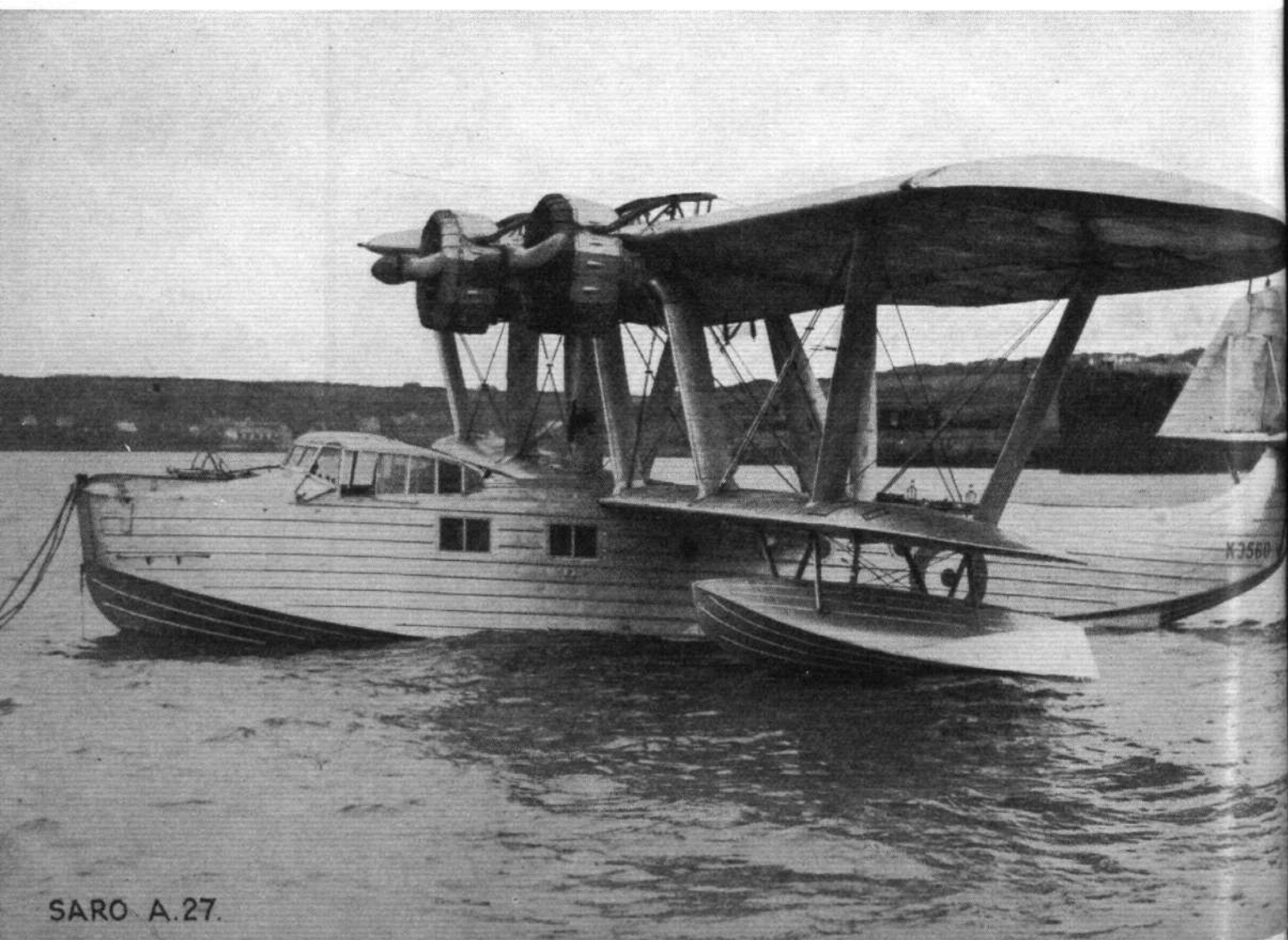
MAX. SPEED: *158 m.p.h. at sea level.*

LENGTH: *26' 1"*; SPAN: *40' 2"*. *Suitable for private owners or "feeder line" work.*





"VILDEBEEST"



SARO A.27.



VICKERS "VILDEBEEST"

TYPE : Torpedo Bomber Biplane.
 ENGINE : 622 h.p. Bristol "Pegasus M"
 air-cooled 9-cyl. geared radial, super-
 charged.
 MAX. SPEED : 141 m.p.h. at 6,560 ft.
 LENGTH : 36' 8"; SPAN : 49'. Adopted
 by R.A.F. as a standard torpedo bomber.

AVRO 652 "AVA"

TYPE : High-speed Commercial Monoplane.
 ENGINES : Two 290 h.p. Siddeley "Cheetah
 VI" air-cooled 7-cyl. supercharged radial.
 MAX. SPEED : 195 m.p.h. at 6,000 ft.
 LENGTH : 42' 3"; SPAN : 56' 6". Two
 examples recently built for Imperial
 Airways.

SARO A.27 ("LONDON")

TYPE : General Purpose Flying Boat.
 ENGINES : Two 690 h.p. Bristol "Pegasus
 III" air-cooled 9-cyl. geared radial,
 supercharged.
 Performance figures not available.
 LENGTH : 56' 6"; SPAN : 80'. Recently
 adopted for use in the Royal Air Force.

B.A. "EAGLE"

TYPE : Three-seater Cabin Monoplane.
 ENGINE : 130 h.p. D.H. "Gipsy Major"
 air-cooled 4-cyl. inverted "in-line."
 MAX. SPEED : 148 m.p.h. at sea level.
 LENGTH : 26'; SPAN : 39' 3". Also
 available with 200 h.p. "Gipsy Six"
 engine. Has retractable wheels.





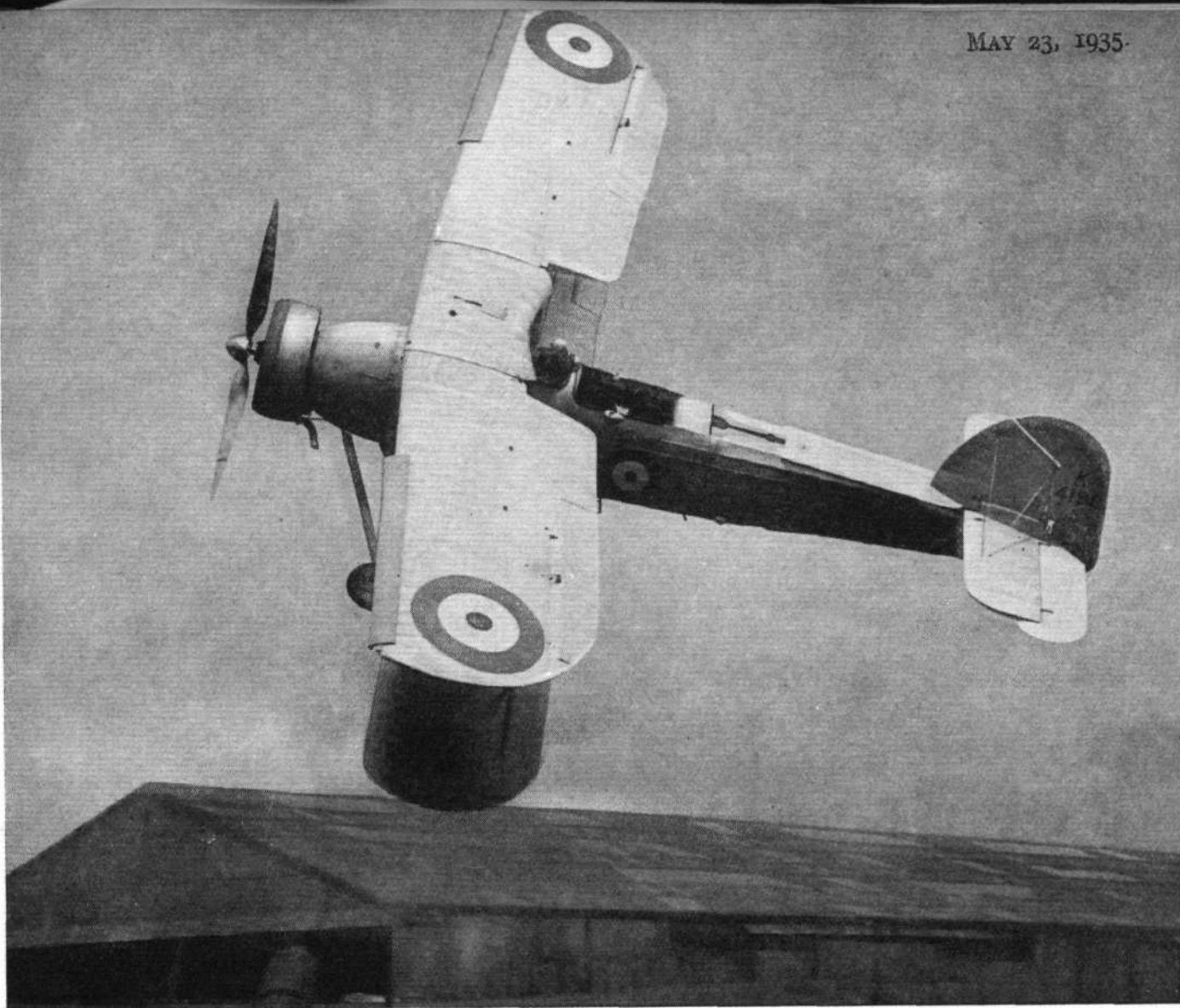
AIRSPEED "ENVOY"

TYPE: *Twin-engined Commercial Monoplane.*
ENGINES: *Two 240 h.p. Siddeley "Lynx IVC" air-cooled 7-cyl. direct drive radial.*
MAX. SPEED: *174 m.p.h. at sea level.*
LENGTH: *34' 6"; SPAN: 52' 4".*
Adopted for use on certain internal lines.

ARMSTRONG-WHITWORTH A.W.19.

TYPE: *Two-seater General Purpose Biplane.*
ENGINE: *725 h.p. Siddeley "Tiger IV" air-cooled 14-cyl. geared radial.*
Performance figures not available.
LENGTH: *42' 2"; SPAN: 49' 8".* *Produced for Air Ministry "G.P." competition.*





FAIREY "SWORDFISH"

TYPE: Torpedo Spotter Reconnaissance Biplane.

ENGINE: 690 h.p. Bristol "Pegasus IIIM" air-cooled 9-cyl. geared radial, supercharged.

Performance figures not available.

LENGTH: 37' 1"; SPAN: 45' 6". In production for Fleet Air Arm.

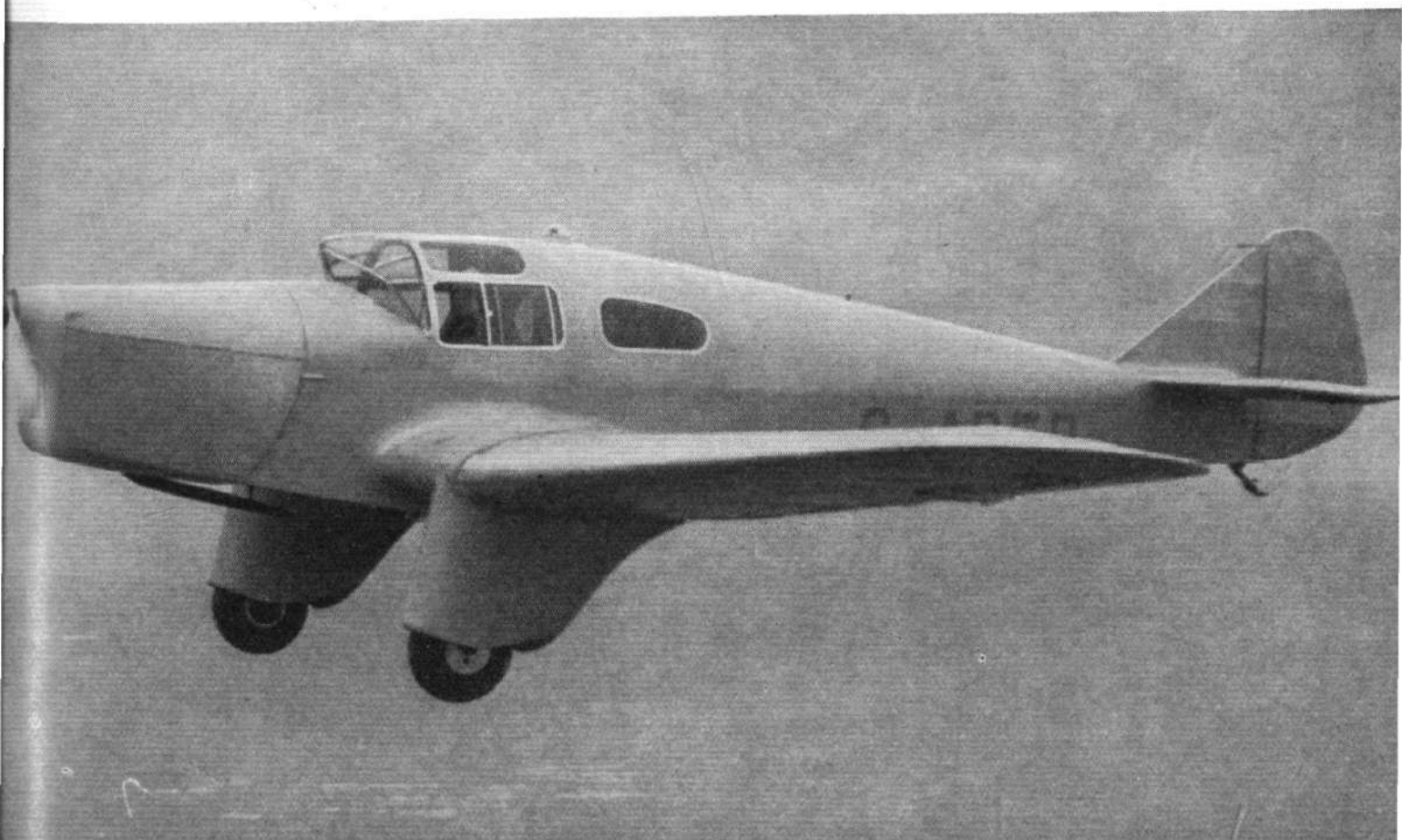
MILES "FALCON"

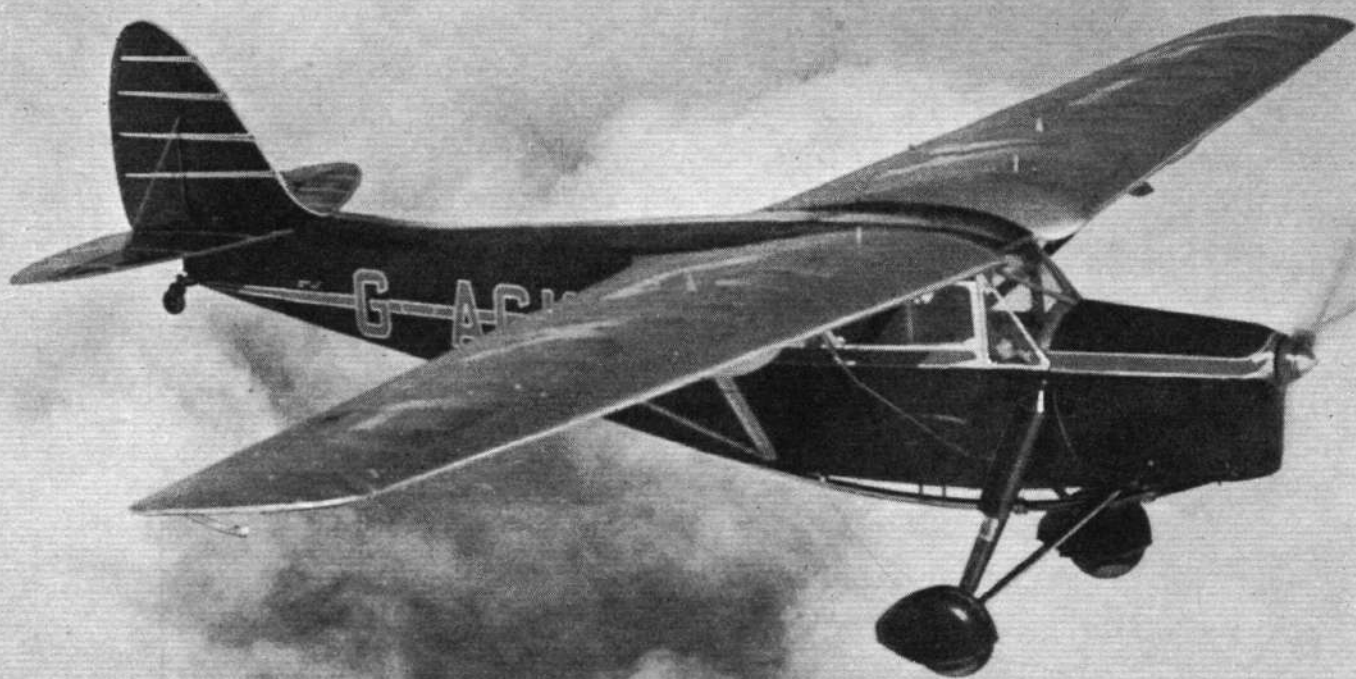
TYPE: Three-four-seater Cabin Monoplane.

ENGINE: 130 h.p. D.H. "Gipsy Major" air-cooled 4-cyl. inverted "in-line."

MAX. SPEED: 148 m.p.h. at sea level.

LENGTH: 25'; SPAN: 35'. Suited for private owners, or "air taxi" operators.





TYPE: Three-seater Cabin Monoplane.
ENGINE: 130 h.p. D.H. "Gipsy Major"
air-cooled 4-cyl. inverted "in-line."

D.H. "LEOPARD MOTH"

MAX. SPEED: 140 m.p.h. at sea level.
LENGTH: 24' 6"; SPAN: 37'
Popular private owner's touring machine

TYPE: Single-seater Day and Night
Fighter.
ENGINE: 605 h.p. Bristol "Mercury
VIS" air-cooled 9-cyl. geared radial,
supercharged.

BRISTOL "BULLDOG IV"

MAX. SPEED: 208.5 m.p.h. at 16,000
LENGTH: 25' 2"; SPAN: 33'
Developed from "Bulldog IIa" used
Royal Air Force.

